

Vol. XI

No. 2

MICROFILM  
ABSTRACTS

*A Collection of Abstracts of  
Doctoral Dissertations and Monographs  
Available in Complete Form  
on Microfilm*







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UNIVERSITY MICROFILMS

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Eugene B. Power

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# AERONAUTICAL ENGINEERING

## ON COMPRESSIBLE LAMINAR BOUNDARY LAYER WITH SUCTION

(Publication No. 2419)\*

Vi-Cheng Liu, Ph. D.  
University of Michigan, 1951

An exhaustive study has been made of the exact methods of solving the compressible laminar boundary layer equations of the flow along a flat plate with suction. The existence of "similar profiles" in the flow is considered as the key to the exact solution of the boundary layer equations.

Two general types of boundary layer flow problems have been discussed: (1) Flow along a flat plate with constant temperature and with suction, (2) Flow along a flat plate with an arbitrary analytic distribution of wall temperature and with suction.

"Similar profiles" is defined as a property of a certain type of boundary layer flow in which the velocity or temperature distribution (or both) can be expressed as function (or functions) of a single variable.

The existence of such similar profiles in the boundary layer flow makes it possible to reduce its associated boundary layer equations to an ordinary differential equation.

In the second type of boundary layer flow as above mentioned, it is not expected that similar temperature profiles will exist.

A compatibility condition for the existence of similar velocity profiles and similar temperature profiles in the first type of boundary layer flow (as above mentioned) and similar velocity profiles alone in the second type of boundary layer flow has been developed. For the boundary layer flow over the plate with constant temperature and with suction, Prandtl number and specific heats are assumed to be constant. Through similar profiles transformation, the boundary layer equations are reduced to a system of two ordinary non-linear differential equations which are solved by a special method of successive approximation. For the boundary layer flow of the second type, one additional assumption is made, namely,  $\mu = CT$ . In this case the momentum equation alone is reduced to an ordinary differential equation of Blasius type while the energy equation becomes a partial linear differential equation. The latter is solved by method of separation of variables.

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\* Microfilm copy of complete manuscript of 136 pages, \$1.70. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-163.

The three configurations of suction distribution which are compatible with the existence of "similar profiles" as above mentioned are as follows:

1. Uniform tangential velocity and zero normal suction.
2. Uniform tangential velocity and normal velocity prescribed proportional to the wall temperature (for this case similar profiles exist at infinite distance downstream from leading edge of the plate.)
3. Uniform tangential velocity; normal velocity prescribed proportional to the wall temperature and inversely proportional to the square root of distance from the leading edge of the plate.

An extensive set of calculations has been made for different types of boundary conditions in which the intensity of suction and the wall temperature are varied.

Results indicate that normal suction is more effective in reducing the thickness of boundary layer than tangential suction. Thin boundary layer is desirable in laminar stability considerations and superaerodynamic wind tunnel design.

Approximate formulas for rapid prediction of skin friction coefficient and heat transfer coefficient have been derived. The results calculated by using these approximate formulas show excellent agreement with the "exact values" from laborious step-by-step integration.

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

### THE EFFECT OF DIET ON CALCIUM PHOSPHATE DEPOSITS IN GUINEA PIG TISSUES

(Publication No. 2322)\*

Ting Yao Hsueh, Ph. D.  
University of Missouri, 1949

A report from this laboratory published several years ago stated that synthetic diets support practically normal growth of guinea pigs and are at least partially adequate during the reproductive cycle. These investigations were interrupted for some months, but when resumed the earlier results could not be duplicated. The animals grew slowly, the mortality rate was high and reproduction did not occur. Another symptom of inadequacy

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was the appearance on the toes and pads of the feet, of small white spots made up of crystalline calcium phosphate. In a later stage large deposits of calcium phosphate developed on the elbows, hock joints, ribs, and at numerous points just beneath the skin. The abnormality is probably identical with the one described by Wulzen and Bahrs in 1941. An attempt was made to find the cause of the discrepancy between the earlier and later work and it developed that the later failures were due entirely to an increase in the amount of phosphorus in the diet. In an attempt to confirm and extend these observations four rations were compared. Ration 902 contained 0.8 per cent of calcium and 0.53 per cent of phosphorus. Ration 903 contained 0.8 per cent of calcium and 0.94 per cent of phosphorus. Ration 1237 contained 0.8 per cent of calcium and 1.56 per cent of phosphorus. Ration 1238 contained 1.5 per cent of calcium and 0.94 per cent of phosphorus. The animals on Rations 903 and 1237 grew most slowly, and those on Rations 902 and 1238 grew most rapidly.

The blood of a number of animals on the various diets was analyzed for calcium and inorganic phosphorus. The amount of calcium was approximately the same on all diets, but there were large differences in the amount of inorganic phosphorus. The lowest average percentage, 5.7, was found in the blood of animals that consumed Diet 902. The next lowest was in the blood of animals that consumed Diet 1238 but the difference was not highly significant. There was a definite increase in the inorganic phosphorus of the blood of animals that consumed Diet 903 and the difference was highly significant. The largest increase was in the blood of animals that consumed Diet 1237, with an average of 9.7 mg. per 100 ml. On every experimental diet, however, the average amount of inorganic phosphorus in the blood was over 4.6 per cent, which was the average for the animals on the stock diet. This indicates that the best of the experimental diets was slightly inadequate.

All visible deposits of calcium phosphate were removed from samples of muscle, kidney, stomach, and intestine, and the tissues remaining were analysed for ash content. The amount of ash in the muscle was lowest on Diet 902 and highest on Ration 1237, but none of the differences was highly significant. Crystalline calcium phosphate could be observed in microscopic sections of some of the muscles, but the total amount was small. The analyses of the other tissues did not reveal consistent differences.

## AGRICULTURE

### REACTION OF WINTER BARLEY VARIETIES TO COLLECTIONS OF USTILAGO NUDA

(Publication No. 2327)\*

Charles Kenneth Cloninger, Ph. D.  
University of Missouri, 1951

Forty-eight winter barley varieties and selections, originating from varied sources in the United States and from the United States Department of Agriculture World Collection, were studied for their reaction to Ustilago nuda (Jens) Rostr. Thirty collections of U. nuda obtained from ten states and five Races of this fungus were used as sources of inoculum. Inoculations were made by injecting a chlamydospore-suspension into four heads of each variety within one day of anthesis.

Varieties from the rough-awned Tennessee winter types, introduced varieties commonly grown in the United States, and varieties from the composite crosses were, in general, susceptible to all collections. Davidson, from a composite cross, was resistant to certain collections. An excellent source of resistance to U. nuda was found in certain hooded Tennessee winter type varieties and in hooded selections made from Missouri Early Beardless. Tucker, from the hooded group, was resistant to only two collections. An awned selection, Missouri B580 from the cross Admire x Missouri Early Beardless, was resistant to seven collections. Other bearded hybrid selections from the Missouri Agricultural Experiment Station show promise of being an excellent source of resistance to this disease. However, only one year's data is available on these. Varieties from the United States Department of Agriculture barley World Collection varied in their response according to the collection used. These may also offer excellent sources for resistant parental material. Physiological specialization of U. nuda is evident from the study. Nine physiologic Groups of possible physiologic Races are proposed.

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## ANATOMY

### LOCALIZATION OF AN EXPERIMENTAL HYPOTHALAMIC AND MIDBRAIN SYNDROME SIMULATING SLEEP

(Publication No. 2409)\*

Emma Cora Hafer, Ph.D.  
University of Michigan, 1951

The object of this study was to localize more precisely the areas in the hypothalamus and in the midbrain which are concerned with the maintenance of the "waking state" and which destroyed result in a "sleep-like state."

Electrolytic lesions were made in the brains of seven *Macaca mulatta* monkeys, using the McCulloch modification of the Horsley-Clarke stereotactic apparatus for locating the desired sites in the caudal hypothalamus and in the rostral midbrain tegmentum. Post-operative effects were followed and photographed where possible. The three somnolent monkeys and the one animal showing torticollis, which survived for an interval of from 18 to 24 days after the successful operation, were sacrificed and their brains prepared for microscopic study by the Marchi method of straining degenerated myelin.

The sleep-like syndrome consists of a combination of visceral and somatic components which are evident in varying degrees. Among the visceral components are: decreased rectal temperature, decreased respiratory rate, change in heart rate and constriction of the pupils (which may be masked by oculomotor nerve involvement). The somatic components include: a deficiency in spontaneous movements (necessary for feeding, vocalization and facial expression), a flexed sitting posture, a tendency to retain unusual positions for long periods of time and a complete lack of awareness to the surroundings except when maximal stimuli are applied.

In all three of these somnolent monkeys, following either unilateral or bilateral hypothalamic lesions, a well-degenerated tract could be traced through the lateral hypothalamic area from caudal tuber and mammillary body levels caudally into the tegmentum of the midbrain, where they spread out and disappeared in the vicinity of the ventral part of the deep mesencephalic nucleus.

Since the fibers degenerated caudal to the lesion, there must be descending fibers present with their cells of origin possibly

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in one or several of the following hypothalamic nuclei-lateral, ventromedial and posterior hypothalamic nuclei. There is the probability also that either there are ascending fibers present in the bundle or that some of the descending fibers are unmyelinated.

In conclusion, there is a definite correlation between the amount of damage to the above tract and the degree of somnolence in the monkeys.

#### AN ANATOMICAL AND EXPERIMENTAL STUDY OF TEMPORAL AND OCCIPITAL ASSOCIATION AREAS

(Publication No. 2410)\*

Lloyd Jean Lemmen, Ph.D.  
University of Michigan, 1951

This is an anatomical study of portions of the temporal and occipital association areas in *Macaca mulatta* which on cortical stimulation resulted in eye, face, trunk, and extremity movements depending upon the particular area stimulated. Certain of these animals were studied preoperatively and postoperatively in visual and auditory discrimination tests.

The normal anatomical material was studied by the Weil technique and the experimental material by the Swank and Davenport modification of the Marchi stain. The cortical stimulation was done using a minimal faradic current. In a series of pull-in visual box and bell box tests, certain animals were taught to discriminate between these visual and auditory stimuli. Using a specially built cage, one animal was taught a finer auditory discrimination test.

On cortical stimulation, a pattern of complex face, neck, trunk, and extremity movements on lower area 19 (Brodmann's classification) was elicited, supplementing the pattern of eye movements on upper area 19. On stimulation of that portion of area 22 (Brodmann's classification) adjacent to the primary auditory cortex, a pattern of eye, face, neck, and extremity movements was obtained. In the anatomical material fiber paths (internal cortico-tectal tract, preoccipital division, external cortico-tectal tract, cortico-tegmental tract, occipital and temporal divisions) were found to be associated with the areas from which eye movements were elicited. From the areas of complex

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movements of face, neck, trunk, and extremities, degenerated fibers passed to subcortical centers including basal ganglia, red nucleus, substantia nigra, and tegmentum of the midbrain. In the pull-in visual and auditory box tests, no impairment was found in the animals' abilities to perform these tests after partial ablations of temporal and occipital association areas. A *Macaca mulatta* who was trained in a fine auditory discrimination test showed no loss in its ability to perform the test after bilateral ablation of the superior temporal gyrus adjacent to the primary cortical auditory center.

The general conclusion is that there exists a pattern of movements elicited by electrical stimulation in the occipital and temporal association areas, which have corticofugal pathways to subcortical centers. There was no demonstrable loss in the animals' abilities to perform visual or auditory discrimination tests following partial cortical ablations of these areas.

## ANTHROPOLOGY

### THE PREHISTORIC CULTURAL POSITION IN THE SOUTHEAST OF KOLOMOKI, EARLY COUNTY, GEORGIA

(Publication No. 2460)\*

William Hulse Sears, Ph. D.  
University of Michigan, 1951

Kolomoki, one of the larger prehistoric Indian sites in the Southeastern United States, is located in Early County in southwest Georgia, a few miles from the Chattahoochee River. Approximately three hundred acres are taken up by a complex of eight mounds, including one truncated pyramidal temple mound, and several village areas. Two seasons of excavation, one in the village areas and one in a mound, have indicated that the site was occupied by several discrete cultures and by one of these cultures during a period sufficiently long for considerable change to have taken place. The sequence as known to date is:

First: A small village characterized by a variant of Middle Swift Creek Complicated Stamp related to similar pottery in central Georgia.

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**Second:** A large village area with the dominant ceramics those of the Weeden Island series of the Florida Gulf Coast area.

**Third:** The major occupation of the site develops from the above groups. The major pottery type of this occupation is Kolomoki Complicated Stamp, a new type developed from the Swift Creek series. At least one burial mound and the temple mound are manifestations of this culture as indicated by ceramics in the burial mound and by the position of the temple mound in relation to the village and plaza. In the burial mound the Weeden Island mortuary tradition was maintained, but changes in some pottery types appeared in the associated typical Weeden Island cache. An important ceramic innovation is Mercier Red on Buff. This latter type is closely related to shell tempered Middle Mississippi types to the north and west.

**Fourth:** A small group using a mixture of Lamar and Fort Walton ceramics lived in a limited part of the site. Another new pottery type, Mercier Check Stamp, was introduced by this group.

The relationship of the various cultures at Kolomoki with other southeastern cultures is analyzed particularly in the case of the Weeden Island-Kolomoki development. Relationships of the latter with mature Middle Mississippi cultures to the north and west are recognized and documented insofar as possible.

Through the presence of the Weeden Island component and the persistence of the Weeden Island mortuary tradition into the Kolomoki period, an entry into the larger problems of the Weeden Island culture is gained. A chapter on Weeden Island reviews the available evidence, introduces a new set of temporal indicators, and points out cross relationships of Weeden Island with Middle Mississippi.

Since the Kolomoki culture used predominantly complicated stamped ceramics, and since such are important in the Weeden Island culture, a chapter on complicated stamping in Georgia is also included. The relationships through time and space of the various types known to date are discussed.

The final chapter presents an historical reconstruction and interpretation of Kolomoki.

## ART AND ARCHEOLOGY

### FEDERAL GOVERNMENT AND THE ARTS

(Publication No. 2351)\*

Norman Pietan, Ph. D.  
Columbia University, 1950

#### 1. The Problem

A survey of the role of federal government and the arts in the United States.

#### 2. Method and Sources

Most of the research was done "on the spot" in Washington, D. C. This included:

- (1) A questionnaire which was sent to a great number of persons both in and out of government.
- (2) Further correspondence and personal interviews.
- (3) Examination of actual project records and files.
- (4) Survey of numerous secondary sources.

In addition to the above, the writer visited numerous post offices, libraries, housing projects, dams, National Park and Forest Service buildings, etc., in various parts of the country.

#### 3. Findings

Government participation in the arts before the Franklin Roosevelt Administration was "government in art for itself." These activities included the designing of the Federal City; designs for coins, stamps, Flag and Seal; and the accumulation of statues, monuments, paintings and portraits of political and military heroes. Following this, with the depression of 1929, the emphasis was changed to "government in art for the people."

After 1933, three major art projects were started in the government. These were the Public Works of Art Project, the Special Skills Division of the Resettlement Administration, and the Federal Art Project of the WPA. The last one was the nationwide program of community art centers, the Index of American Design, mural painting, sculpture, and art classes.

The WPA included three other large projects. These were the Federal Music, Theatre, and Writers' Projects. The Federal Music Project included a Public Concerts Division and a

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Composer's Forum Laboratory. The Federal Theatre Projects developed a program of experimental drama, "The Living Newspaper." The Federal Writers' Project published over 480 pamphlets and books, including the STATE GUIDES.

In architecture there are three major examples of organic and indigenous design. These are the major TVA dams and powerhouses, the Greenbelt Projects and similar community housing developments, and the National Park and Forest Service lodges, ranger stations, etc.

During this same administration, some work was done in the area of Federal photography and films. The documentary film section of the Farm Security Administration produced "The River" and "The Plow that Broke the Plains." The photography section produced a collection of 100,000 photographs as the "Portrait of America."

Although the war cut short the various cultural projects started under the Franklin Roosevelt Administration, and we have done nothing on a major scale since, there are two recent ventures in the arts which should be mentioned. The first of these is the story of the State Department's exhibitions of modern American Art, sent abroad on good-will missions, and later recalled by Congress and the paintings sold as "war surplus." The other is the record of our participation in UNESCO.

In conclusion it should be noted that whenever a government enters the area of the arts, there is always the danger that it may use these arts as propaganda. This has happened in a great many countries to date. In order to avoid any such danger here, any future federal government art programs will have to be based on the programs that are now in effect on the local level. Such things as community theatres, band concerts, literary study clubs, etc. are the basis for our national art at the present time. If the government is to help, it must do so only as an aid to what is already in progress and not as a nation-wide program superimposed from Washington.

## BACTERIOLOGY

### THE EFFECT OF THYROXIN, THIOURACIL AND 2,4-DINITROPHENOL ON THE SUSCEPTIBILITY OF ALBINO MICE AND RATS TO THE MENINGOPNEUMONITIS VIRUS AND THE EFFECT OF THIS VIRUS ON GLYCOLYSIS BY HOMOGENATES OF THE BRAINS OF THESE ANIMALS

(Publication No. 2404)\*

Arnold Howard Fieldsteel, Ph. D.  
University of Michigan, 1951

It is now well established that viruses stimulate cell proliferation as well as causing cellular death. These findings, however, give no insight into the fundamental mechanism of resistance or susceptibility of host cells to virus infections. Since thyroxine is known to increase basal metabolism in animals and thiouracil to specifically inhibit thyroxine production, a strain of the meningopneumonitis virus, highly virulent for mice and relatively avirulent for rats, was inoculated intracerebrally into these animals and thyroxine and thiouracil subsequently injected to determine the influence of changes in metabolism on the susceptibility of these hosts. In addition, the influence of 2,4-dinitrophenol, which has an action similar to thyroxine with the advantage of more rapid and profound effects, was studied in rats.

The  $LD^{50}$  of the virus was  $10^{-6.5}$  for mice both young and adults. This titer remained unaltered in the presence of either thyroxine or thiouracil. It was impossible to obtain a similar value with rats because of relative immunity. However, ten per cent suspensions of infected mouse brain or undiluted infected allantoic fluid gave a mortality rate of about 30 per cent. Again, as with the mice, there was no pronounced influence of thyroxine or thiouracil on the susceptibility of the rats although there were some indications that thyroxine at toxic levels favored the multiplication of the virus in the brains of young rats. The susceptibility of young rats was increased by the administration of 2,4-dinitrophenol but was ineffective with adults.

The second part of the investigation was a comparison of the effect of the meningopneumonitis virus on glycolysis by the brain tissues of mice and rats. This tissue has a respiratory quotient of 1.0 which indicates the major pathway of metabolism is through the oxidation of carbohydrate. The Warburg manometric technique was employed to observe glycolysis, and the tissue

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homogenates were fortified by the addition of buffers, salts and coenzyme. Glycolysis by homogenates of mouse brain was unaffected by the presence of the virus using either a glucose or hexosediphosphate substrate.

Homogenates of infected rat brain gave a significant decrease in the rate of glycolysis between the first and second hours of incubation on a glucose substrate. In a large number of experiments glycolysis by infected brain was completely inhibited after 90 minutes. Complete inhibition was prevented when hexosediphosphate was the substrate, but only a partial reversal of the decline could be brought about on this substrate between one and two hours. No significant difference in apyrase activity could be detected between homogenates of normal and infected rat brains. The addition of partially purified suspensions of the virus to homogenates of normal rat brain had no effect on glycolysis by this tissue.

#### THE ANTIGENIC STRUCTURE OF *H. CAPSULATUM*, PARTICULARLY THE YEAST PHASE

(Publication No. 2412)\*

Robert Benjamin Lindberg, Ph. D.  
University of Michigan, 1951

Histoplasma capsulatum differs from most pathogenic agents in occurring in two morphologically distinct forms: as a yeast in the tissues of the infected host and as a mold when cultured on artificial media. Tests for altered sensitivity in this disease or for the presence of circulating antibodies as aids in diagnosis have usually been carried out with a mycelial broth culture filtrate (histoplasmin), because of the lack of suitable cultures of the yeast phase. The data obtained have frequently been criticized because of the seeming lack of sensitivity and specificity. Since the mold phase differs so strikingly morphologically from the tissue-invading yeast phase, it would seem desirable if not imperative that metabolic products from the latter form be obtained for such procedures.

Methods were developed for the artificial cultivation of H. capsulatum in the yeast phase. Nine strains in the mold phase were grown on a peptone blood broth containing 0.2 per cent agar. When incubation was carried out in closed containers at

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37°C. with a relative humidity of over 95 per cent, reversion of the mycelial to the yeast phase occurred. A luxuriant growth of the pure yeast phase could be maintained on a medium composed of peptones, heat coagulated rabbit blood, and 1.4 per cent agar, under conditions of incubation as described above and with transfers every three days. A liquid medium for obtaining the metabolic products of the yeast phase was desired, and in a casein hydrolysate-Tween 80 (polyoxyethylene sorbitan monooleate) broth, growth suitable for this purpose was obtained. The mold phase, which grows readily on a variety of media, was cultivated on an asparagine-yeast extract broth, in order to obtain simultaneous production of mycelial cells and of histoplasmin.

The following preparations were made with the yeast phase cells: suspensions of young intact cells in physiological saline, suspensions and extracts of ground cells, and supernatant fluids of broth cultures obtained by centrifugation. Mycelial phase cultures were ground and suspended in physiological saline, and histoplasmin was obtained in the broth culture filtrate. Suspensions of mixed yeast-mycelial cultures were also prepared. Antisera were developed in rabbits by intravenous injection of the preparations just noted. The time of appearance of antibodies, the titers obtained, and their disappearance from the blood stream were carefully followed.

The substances employed as antigens to stimulate antibody formation were used to detect the presence of homologous and heterologous antibodies in the complement fixation and precipitin reactions together with sensitization and passive transfer of sensitivity.

There were three distinct antigenic components associated with young intact yeast cells:

1. An antigen which reacted at a relatively low titer in the complement fixation reaction. It served as a precipitinogen and also evoked a sensitized state in rabbits, giving a delayed non-transferrable type of reaction.
2. An antigen which reacted at high titers in the complement fixation reaction and which stimulated a high level of antibody formation. It did not serve as a precipitinogen.
3. An antigen which reacted at an intermediate level between antigens No. 1 and 2 in the complement fixation test. It reacted in the precipitin test and elicited a sensitization which gave an accelerated response and a positive Prausnitz-Küstner reaction. This antigen was present as a soluble metabolite in broth cultures.

The ground mycelial cells contained an antigen which functioned in a manner similar to that of the number 1 antigen of the

yeast cell. No other antigens were detected in mycelial preparations. Cell-free broth cultures of the mycelial phase (histoplasmin) contained an antigen which reacted with the antibodies called forth by antigen No. 1 but did not stimulate their production (? a haptene).

On the basis of these findings with animals the yeast phase of *H. capsulatum* is the form which logically should be employed in the preparation of substances to be used as aids in the diagnosis of human histoplasmosis, and for the detection of sensitization to this organism.

#### THE EFFECTS OF VARIOUS CHEMICAL SUBSTANCES AND BACTERIA ON THE GLYCOLYTIC AND RESPIRATORY ACTIVITIES OF LEUKOCYTES

(Publication No. 2431)\*

Rafael Marinelarena, Ph.D.  
University of Michigan, 1951

The effect of various substances and cell activities on the glycolytic and respiratory functions of leukocytes has been determined. Information about the carbohydrate metabolism of these cells has been obtained by studying the action of metabolic substrates, intermediates and selective inhibitors on glycolysis and respiration.

Leukocytes were obtained by the intraperitoneal injection of large volumes of Locke's solution into guinea pigs and rats with the subsequent recovery of the cells from the induced peritoneal exudates. Glycolysis and respiration were measured by the Warburg technique.

Maintenance of a pH 7.4 was essential for the two functions to proceed. Homologous serum in concentrations as low as 10 per cent had a beneficial effect on respiration. No correlation was found to exist between the ascorbic acid level of the donor animal and the respiration of their leukocytes.

The respiratory activity of the leukocytes was stimulated by the addition of heat-killed streptococci, an organism amenable to phagocytosis. The increase occurred immediately following the addition of the bacteria and diminished rapidly after 30 minutes. Heat-killed encapsulated type 1 pneumococcus, an organism resistant to phagocytosis, failed to stimulate respiration.

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Respiration was also stimulated by corn starch granules and commercial gastric mucin.

Type 1 pneumococcus polysaccharide did not interfere with either glycolysis or respiration of guinea pig leukocytes.

Spiro- (2-ketomorpholine-4, 4-morpholinium) bromide had little or no effect on the activities under consideration. Beta-formyl-beta, beta-dimethylethyltrimethylammonium bromide caused a marked initial increase in glycolysis but had no effect on respiration except in a concentration of 1:1,000, at which value it was inhibitory. Both compounds increased phagocytosis of streptococci.

Fructose was rapidly glycolysed by leukocytes. Hexose diphosphate was glycolysed at a slower rate. The effect of galactose was very slight.

Glucose was rapidly glycolysed, however, glucose, lactate, acetate and alanine did not undergo oxidation by these cells.

The respiration of leukocytes was increased by the intermediates of the tricarboxylic acid cycle as well as by glutamic and aspartic acids.

Sodium fluoride and iodoacetic acid inhibited glycolysis.

Potassium cyanide in low concentrations as well as sodium malonate inhibited respiration.

The results obtained in the presence of intermediates and inhibitors suggested that the carbohydrate metabolism of leukocytes is essentially the same as that of other cells.

## BIOGRAPHY

### JOHN W. BURGESS, AMERICAN SCHOLAR, BOOK I: THE FOUNDING OF THE FACULTY OF POLITICAL SCIENCE

(Publication No. 2345)\*

Ralph Gordon Hoxie, Ph. D.  
Columbia University, 1950

This is the first part of a projected life of John W. Burgess and includes the years from his birth in 1844 through the founding of the School of Political Science in 1880. At the same time the dissertation seeks to present a view of the changing scene of higher education in the United States in the first fifteen years

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after the Civil War. Since it is a biographical study, especial attention is paid to the two institutions with which Burgess was principally associated, Amherst and Columbia. However, something of the changes going on at Harvard, Yale, Cornell, Michigan, and the new Johns Hopkins, particularly in the political and social sciences, are also noted. Moreover, the impact of ideas from the European universities, especially those of Germany, is assessed.

Burgess was born and reared in south central Tennessee during a period of great social and political controversy. From his father, who was both a slave owner and a strong nationalist, he gained much of his point-of-view of the American political and social scene. His brief period of schooling at Cumberland University and his Civil War experiences strengthened his nationalist convictions, but the havoc of war also deepened the sadness which encompassed his entire life.

As a student at Amherst from 1864-67 Burgess acquired, largely from Julius Hawley Seelye, a philosophical view combining Hegelianism with New England Puritanism and democracy. Although there followed a valuable apprenticeship at the law, his chief interest lay in public law and political science rather than private law, and after a brief period as a teacher at Knox College he studied from 1871-73 at Göttingen, Leipzig, and Berlin. In Germany, his patron, George Bancroft, and Professors Droysen, Mommsen, and von Gneist were particularly influential, and he returned to his Alma Mater fired with ideas of introducing the type of advanced instruction which he had received in the German universities.

During his three years as a young Amherst professor, Burgess developed a number of outstanding students, conducted a pioneer graduate seminar, did much to modernize the library, established a veritable school of scholars returning to Germany for advanced instruction, and injected much of the scientific spirit into the pietistic clime. However, rebuffed at Amherst in his ideas for graduate instruction, he accepted a professorship at Columbia in 1876 as the successor to Francis Lieber.

Burgess was distressed to find Columbia with a narrow and restricted curriculum and inadequate facilities. His particular discontent was heightened by his knowledge of the advances being made by Cornell, Michigan, Harvard, Yale, and Johns Hopkins. The next four years he was engaged in a continuous struggle not only to raise the level of instruction in history and political science and liberalize the law curriculum but also to transform the entire institution into a modern university. He worked closely with President F. A. P. Barnard and Trustee Samuel B. Ruggles to institute library reforms, strengthen the faculty and secure

the general introduction of graduate instruction and modern language electives as well as the establishment of the School of Political Science. In all of these advances Burgess was greatly aided by the advice and encouragement of English, French and German scholars. By 1880 Columbia had clearly begun its transformation towards becoming a university in spirit, structure, and facilities, but it was apparent that Burgess would not rest content, that the road ahead would be a challenging one.

## BIOLOGICAL CHEMISTRY

### THE ANTILIPOTROPIC ACTIVITY OF CYSTINE

(Publication No. 2470)\*

Evelyn Alice Pease Tyner, Ph. D.  
University of Michigan, 1951

In a study of the antilipotropic activity of cystine in relation to the general problem of dietary fatty liver, 200 male rats were fed low-protein (5 per cent casein), high-fat (40 per cent lard) diets to which were added various supplements. Each experiment consisted of a "control" and a "cystine" series of animals. At the end of a three-week feeding period, the animals were killed, their livers excised and subsequently analyzed for total lipid content.

The Student-Fisher "t" test was applied to determine significance of data. It was found that under the conditions employed in these experiments, the antilipotropic effect (the ability to aggravate fatty livers) of cystine could not be demonstrated unless the content of niacin in the diet was reduced to 1.5 mg. per 100 gm. diet. When yeast (in the form of commercial yeast tablets) was introduced into the diet in place of purified vitamins, the "cystine effect" could be demonstrated. However, when 3.75 mg. niacin per 100 gm. diet was present, "control" and "cystine" series of rats did not differ significantly in content of liver lipid; i. e., the cystine effect could not be demonstrated. Similarly, when tryptophan was added at a relatively high level to a diet completely lacking in niacin, the cystine effect could not be demonstrated; this is new evidence of the metabolic interrelationship between niacin and tryptophan.

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When the effect of threonine was studied, divergent results occurred. No conclusions with respect to the relation of threonine to the problem of dietary fatty liver can be drawn at this time.

## BOTANY

### THE DISTRIBUTION OF CALIFORNIAN MOSSES

(Publication No. 2416)\*

Leo Francis Koch, Ph. D.  
University of Michigan, 1951

In California, four distinct distributional patterns of mosses which may have definite environmental values are: (1) Wide-spread, in the coastal ranges and also in the Sierra Nevada but not in the Mohave Desert, the Colorado Desert, or the Great Basin. (2) Montane, only above 3000 feet altitude. (3) Coastal, in the Coast Ranges and near the Pacific Ocean. (4) Desert, in the arid region of southeastern California. These patterns agree more closely with the vegetational areas of Shreve, 1917, than with the units of any of the seven other systems of classification of vegetational types considered.

The concept of floral element as expressed in the literature dealing with phytogeography is considered to be inadequate for a basic unit. A proposal is made for the derivation of more homogeneous groups of species by the application of evidence from phytogeography, ecology, and paleobotany in three successive steps. The basic or "floral unit" is a group of taxonomic entities having a basically similar geographical distribution, essentially equivalent ecological characteristics, and a common migrational history.

The geographical distribution of Californian mosses has been analyzed in two steps. Groups of species having similar distribution in terms of continents are designated as "floral divisions," and groups of species within each division having basically similar patterns of distribution are termed "floral elements." In the absence of direct evidence, essentially equivalent ecological responses are assumed for those species which are associated in a specific type of habitat. Groups of species having a basically

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Similar geographical distribution and essentially equivalent ecological attributes are designated as "floral fractions." The necessary ecological knowledge for the determination of fractions of the Californian moss flora does not exist. In the absence of paleobotanical evidence to the contrary, fractions may be presumed to have functioned as floral units.

A comparison of the geographical distribution of Californian mosses and of Californian higher plants revealed two important differences. (1) A smaller percentage of mosses than of higher plants is restricted to California, to North America, and to the northern hemisphere. (2) The species of mosses endemic to California appear to be more widely distributed geographically than are most of the endemic higher plants. These differences are the basis for two hypotheses relating to the geography of mosses and higher plants generally. In any limited area, (1) there is a smaller percentage of endemic mosses than of endemic higher plants, and (2) the species of endemic mosses are more widely distributed geographically than are the higher plants endemic to the same area.

Perhaps the most important factors influencing the differences are a slower speciation rate in mosses than in higher plants, and the existence of microhabitats open to mosses but not to the ecologically equivalent but larger higher plants. Evidence directly pertinent does not seem to exist in the botanical literature.

#### ANATOMY AND REGENERATION IN THE STEM AND ROOT OF MANIHOT UTILISSIMA POHL

(Publication No. 2450)\*

Bargyla Rateaver, Ph. D.  
University of Michigan, 1951

This is a description of the structure and development of the vegetative shoot and the root of *Manihot*, and a study of the regenerative capacity of its tissues and organs. The plant is a shrub with palmately lobed leaves and basal cluster of fleshy roots in a fibrous root system.

Fresh, macerated and imbedded materials were studied as a whole mounts or sections, and new techniques were developed for such preparations.

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\* Microfilm copy of complete manuscript of 178 pages, \$2.23. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-235.

The shoot apex is organized by the activity of a single, central initial which cuts off derivatives in spiral sequence. The derivatives divide, producing files of subdividing mother cells, which files radiate in all directions to produce all the tissues of the stem and leaf.

The primary stem consists of epidermis, hypodermis, a cortical latex system, cortical parenchyma, five vascular bundles, medullary sheath and pith. Secondary growth initiates cork, vascular, and interfascicular cambia. These tissues produce cork, phelloderm, secondary phloem and secondary xylem.

There are three latex systems in the stem: cortex, phloem, and pith. The latex tubes are articulate vessels which proliferate and anastomose within each system. At nodes the three systems meet.

The root apex is maintained by the activity of one central initial which cuts off derivatives in spiral sequence. By subdivisions of these derivatives, files of mother cells are formed which radiate in all directions to produce the root cap and all the tissues of the root.

The primary root consists of epidermis, hypodermis, cortex, endodermis, pericycle, three to six strands of phloem and a three to six-angled rod of xylem. During secondary growth the pericycle increases in thickness, and cork and vascular cambia are initiated. Cork, phelloderm and secondary vascular tissues are produced. Latex tubes are found in roots only in secondary phloem.

Lateral roots are initiated in the pericycle, and they keep pace with secondary growth.

Advanced secondary growth occurs in a few roots, producing fleshy storage structures. These are formed by rapid increase in the number of ray and wood parenchyma cambial initials, which cut off a great deal of storage tissue particularly in the xylem but also in the phloem. The cells of the tissue are full of large starch grains; they are the economically important portion of the plant.

Regeneration experiments indicated that Manihot is very easily propagated and that it is a good subject for further experiments with agar culture.

Stem cuttings root in soil or water, the roots arising at nodes in groups of four. On agar, any portion of the stem or petiole rooted, but leaf blades and thickened roots did not. Callus formed on all cut surfaces of stem, axillary bud and petiole; it was formed by proliferation from cambium, phloem and pith chiefly. Intumescences were initiated on stem surfaces by proliferation of lenticel tissue, and on young roots by extension of cortical tissue. No activity was seen in any portions of fleshy root.



A REVISION OF THE GENUS Bromus, SECTION  
BROMOPSIS OF NORTH AMERICA

(Publication No. 2472)\*

Harvey Keith Wagnon, Ph. D.  
University of Michigan, 1951

This is a taxonomic treatment of the genus Bromus, section Bromopsis as represented in North America north of Guatemala. Besides the usual morphological characteristics considered by previous workers, this study was supplemented by chromosome counts, and statistical data of guard-cell and pollen-grain size.

Most of the species were grown and chromosome counts for each plant were made. Guard-cell measurements, and generally, pollen-grain measurements as well, were made from dried specimens of the plants. Guard-cell and pollen-grain size were also obtained from herbarium specimens. Data from plants with known chromosomes were correlated with similar data from herbarium specimens. With the aid of these correlated data, closely related species pairs were separated with little difficulty.

The history of the genus Bromus and the section Bromopsis are reviewed. Bromus arvensis is designated as the type or standard species. Affinities of Bromus have been sought in the three tribes, Festuceae, Hordeae, and Aveneae. The 2-toothed lemma condition that has been considered to be characteristic of Bromus is for the most part absent in the North American representatives of the section Bromopsis. Evidence is set forth to show that the sectional name Bromopsis has priority over various others which have appeared in literature.

The native species are divided into four geographic groups, the species in each group exhibiting marked interrelationships. The majority of the species are believed to have had a southern origin. It is postulated that New Mexico, Arizona, western Texas, and northern Mexico were a center of mass hybridization, and that speciation is still taking place.

A systematic treatment of the section Bromopsis as represented in North America is presented. This treatment includes a key to the species as well as descriptions of the species and the section. Each specific description is accompanied by pertinent information, citation of representative material, and except for several species of limited distribution, a map to show the distribution.

\* Microfilm copy of complete manuscript of 286 pages, \$3.58. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-215.

The conclusions are: (1) by the correlation of pollen-grain and guard-cell size of plants with a known number of chromosomes with similar data for herbarium specimens, the chromosome number of entire populations may be inferred when these are represented by specimens in the herbarium only; (2) pollen-grain size is more reliable as an indicator of the chromosome number than are the guard cells; (3) in North America, the section Bromopsis is represented by twenty-five species, two of which are introduced.

## BUSINESS ADMINISTRATION

### BILATERAL DECISIONING: THE PRESENT STATE OF PRODUCTIONAL RELATIONS

(Publication No. 2481)\*

Lawrence Berel Cohen, Ph. D.  
Columbia University, 1950

This study of decision-making on production, and the ways it has been affected by the pressure of workers, is based upon an investigation at the Thompsonville, Connecticut plant of the Bigelow-Sanford Carpet Company.

The basic findings of the study are: (1) that unilateral managerial decision-making, in respect to specific productional activities and conditions, has given way to a system of bilateral decisioning on production; and (2) that there exists an operating system of worker decisioning, which parallels the managerial component of bilateral decisioning.

The new data presented in this study consist of: (1) collective bargaining contracts, side and verbal agreements, and unwritten practices regulating plant activities; (2) detailed analyses of six specific agreements affecting production; and (3) a verbatim transcription of a worker decisioning conference.

Decision-making on production is defined as the process of order-giving to workmen concerning their activities and conditions of work. Under the usual description of industrial organization, decision-making is considered the occupational activity of management, whose decisions constitute the orders which the workforce must carry out.

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\* Microfilm copy of complete manuscript of 240 pages, \$3.00. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-224.

Bilateral decisioning has replaced unilateral managerial decisioning within five areas of productional conditions and activities. These are as follows (the items in parentheses are representative agreement clauses from which they are abstracted):

1. The work group; i. e., the definition of personnel to perform the productive work (hiring, bargaining unit, quits, discharge, etc.).
2. Work time: the periods during which work may, and may not, be performed (work day, work week, holidays, vacation, overtime, etc.).
3. Deployment: the positioning of workers within the plant (promotion, demotion, transfer, layoff, recall, etc.).
4. Performance: the duties performed and the pace of work (job definitions, etc.).
5. Compensation: the incomes received by workers (wages, wage protection, non-wage income, working condition improvements, etc.).

Within these areas, agreements establish various kinds of regulation over production decisions. These are: alternative decisioning criteria (seniority), fixed conditions (hours, wage rates), and standards (hiring, discharge rules, etc.). For some decision subjects there are no substantive regulations, only procedures for resolving differences (workload).

The bilateral system provides for decision-making procedures, machinery for resolving differences, and for periodic reports to the union concerning particular categories of decisions. Altogether, these constitute a formal and effective mechanism for arriving at production decisions.

The existence of worker decisioning is demonstrated by the presentation of a verbatim transcription of a conference in which five local union officials (who are employed workers in the plant) consider the problem of granting management's request for eight hours of overtime work in the dye house during the succeeding two weeks. An analysis of this meeting finds that workers formulate their own plant problems, devise independent solutions to these problems, and apply their own, independent criteria for production decisions. These are carried out within organization forms evolved for the purpose of worker decisioning.

The applicability of these findings to other U. S. manufacturing plants is extensively examined, with the conclusion that "the general framework of bilateral decisioning seems to inhere in the practice of collective bargaining, and develops progressively as collective bargaining becomes increasingly operative within plants."

AN APPRAISAL OF CORPORATE WORKING  
FUND REQUIREMENTS  
A STUDY OF HISTORICAL RELATIONSHIPS BETWEEN  
CURRENT ASSETS AND SALES AS OBTAINED FROM  
ANNUAL REPORTS OF SELECTED COMPANIES

(Publication No. 2477)\*

Eugene Carroll Yehle, Ph. D.  
University of Michigan, 1951

The general objective of this study is to appraise the factors which operate through time to bring about changes in the fund requirements of a selected list of companies. \*\* Included among the factors which are considered are: sales volume, price levels, business conditions, inventory valuation methods, and changes in scale of operations.

A more specific objective is to examine the utility of sales volume as an index of working fund requirements. In other words, we seek to answer the question: do the current assets of a company historically fluctuate with sales volume in a manner which is sufficiently stable to permit a generalization of its demand for funds?

The scatter diagram or correlation chart is used in the analysis with sales on the horizontal axis and current assets on the vertical axis. For the several current assets — cash, accounts receivable, and inventories — a model is developed which represents the theoretical relationship that each asset is expected to bear to sales. Actual data obtained from corporate reports to stockholders covering years from 1930 to 1948 are then compared to these models. In most cases the data are first adjusted for price changes.

The behavior patterns of corporate financial data generally conformed to the theoretical models. Particularly noteworthy were the indications of minimum or base stocks in the inventory-sales relationships, which suggest that the well-known fluctuations in stock-sales ratios may be a natural volume effect rather than a purely cyclical phenomenon.

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\* Microfilm copy of complete manuscript of 157 pages, \$1.96. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-220.

\*\* The companies are: Allied Stores Corporation, Consumers Power Company, Detroit Edison Company, J. C. Penney Company, Republic Steel Company, and Youngstown Sheet and Tube Company.



On the average, the current assets, individually and in total, varied directly and linearly with sales. The year-to-year movements of these variables often departed from the average pattern, however, because of changing economic conditions, dynamic business expansion, and miscellaneous temporal disturbances. These departures were generally magnified rather than subdued by the price adjustments.

In most instances the short-term fluctuations were large enough to prohibit the generalization of working fund requirements as a function of sales. Where they were small, the current assets varied almost proportionately with sales; that is, there was little if any fixed element among the current assets, and therefore an almost one-to-one correspondence seemed to exist between the percentage changes of assets and sales.

It appears that corporate self-analysis of current asset behavior is not likely to be as successful as the self-analysis of cost behavior. Where asset-sales relationships are sufficiently stable to permit a generalization of typical working fund requirements, an analysis simply of ratio trends will, in many cases, give as satisfactory results as a scatter-diagram analysis.

## CHEMICAL ENGINEERING

### A KINETIC STUDY OF THE SYNTHESIS OF METHANE

(Publication No. 2371)\*

William Walter Akers, Ph. D.  
University of Michigan, 1951

In the last decade, the Fischer-Tropsch synthesis, the catalytic conversion of carbon monoxide and hydrogen to paraffin hydrocarbons, has assumed major importance as a source of fuel. As in many other instances, the industrial application of the process has preceded the investigation of the basic physical and chemical principles involved.

In this study, an effort has been made to describe the process by which carbon monoxide and hydrogen react in the presence of a reduced nickel catalyst to form methane, water, and carbon dioxide by measuring experimentally the rate of formation of methane at various concentrations of carbon monoxide,

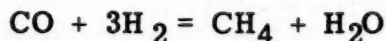
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\* Microfilm copy of complete manuscript of 107 pages, \$1.34. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-115.

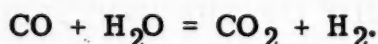
hydrogen, methane, water, and carbon dioxide and over a temperature range 300°-350°C. The dependence of the rate of reaction on the composition and temperature established the possible mechanisms by which the reaction might take place.

To measure the rate, carbon monoxide and hydrogen passed from cylinders through calibrated wet-test meters. After passing through the meters, the two gases were mixed, then passed upward through the reactor. The reactor was encased in a radiant furnace equipped with automatic temperature controls. Since the reaction was highly exothermic, the nickel catalyst in the reactor was mixed with copper granules in order to maintain a constant temperature over the reacting mass. The gas leaving the reactor passed through a water-cooled condenser and then through another wet-test meter. Gas samples were taken intermittently and analyzed. The conversion of carbon monoxide and hydrogen to the product gases was measured at four space velocities for three different feed gas compositions over the temperature range 300° - 350°C. The rate of reaction was then obtained by graphical differentiation of these data.

A stoichiometric and thermodynamic analysis of the data indicate that the methane synthesis reaction on the nickel catalyst is



and carbon dioxide is formed by the side reaction



Carbon is not formed in appreciable quantities under the conditions studied.

For the synthesis of methane, the rate of reaction between the adsorbed reactant molecules on the active centers of the catalyst is the rate controlling step. For a feed of carbon monoxide and hydrogen, the rate of reaction can be expressed by the equation

$$r = \frac{p_{\text{CO}} p_{\text{H}_2}^3}{(A + Bp_{\text{CO}} + Dp_{\text{CO}_2} + Ep_{\text{CH}_4})^4}$$

The constants in the equation were evaluated over the temperature range 300 - 350°C.

The initial rate of formation of carbon dioxide when carbon monoxide-hydrogen mixtures are passed over a nickel catalyst can be expressed empirically by the equation

$$v = A (p_{\text{CO}} - B)$$

The rate remains almost constant until equal to the rate of methane formation. At lower rates, the two are equal, and the



methane rate equation can be used as the carbon dioxide rate equation.

In summation, this study has established the stoichiometry of the primary reaction and the side reaction and has expressed the rates of the reactions in mathematical form. Although these equations are based on the one particular catalyst, they should be applicable for other nickel catalysts since the rate controlling step, the surface reaction of the adsorbed reactant molecules on the active centers of the catalyst, should be the same. Thus only the constants would change for different catalysts.

### THERMODYNAMIC PROPERTIES OF FREON 13

(Publication No. 2372)\*

Lyle Frederick Albright, Ph. D.  
University of Michigan, 1950

The thermodynamic properties of Freon 13( $\text{CClF}_3$ ), a low-temperature refrigerant, were determined for both the saturated liquid and vapor and for the superheated vapor.

This investigation consisted of determining the following physical properties of Freon 13:

1. Vapor pressure from  $-200^\circ\text{F}$  to the critical temperature,  $83.93^\circ\text{F}$ .
2. P-V-T relationship of the vapor from  $-70$  to  $250^\circ\text{F}$  and from 45 to 2000 psia.
3. Saturated liquid density from  $-200^\circ\text{F}$  to the critical temperature.
4. Specific heat of the gas at infinite volume from  $-200$  to  $500^\circ\text{F}$ .

The first three physical properties were measured experimentally. The fourth was calculated from the fundamental frequencies that were determined from spectroscopic data, which were reported in the literature. Empirical equations were derived to predict the above four physical properties. These four equations were then used in thermodynamic formulas to calculate the thermodynamic properties of the saturated liquid and vapor and of the superheated vapor.

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\* Microfilm copy of complete manuscript of 222 pages, \$2.78. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-116.

The thermodynamic properties of the saturated vapor and liquid are reported as values of enthalpy, entropy, pressure, and volume at temperatures from  $-200^{\circ}\text{F}$  to the critical temperature,  $83.93^{\circ}\text{F}$ , for both the saturated liquid and vapor. The thermodynamic properties of the superheated vapors are reported as values of the enthalpy, entropy, and volume at tabular temperatures from  $-200$  to  $5000^{\circ}\text{F}$ . and at tabular pressures from 1.0 psia to the critical pressure, 561.3 psia. A pressure-enthalpy diagram was constructed for the saturated vapor and liquid and for the superheated vapor region. Constant temperature, volume, and entropy lines were drawn in the superheated vapor region of this diagram.

The thermodynamic properties which were determined cover the range of conditions that Freon 13 normally experiences when used as a refrigerant. These properties are presented in a form, which is convenient for designing and operating refrigeration equipment.

#### THE KINETICS OF THE SYNTHESIS OF METHANE FROM CARBON DIOXIDE AND HYDROGEN

(Publication No. 2381)\*

George G. Binder, Jr., Ph. D.  
University of Michigan, 1950

The effect of composition upon the rate of reaction of mixtures of carbon dioxide and hydrogen over a reduced nickel catalyst was investigated at one atmosphere pressure in the temperature range  $500$ - $750^{\circ}\text{F}$  in a continuous pilot unit designed and constructed for operation at pressures up to 30 atmospheres and temperatures up to  $900^{\circ}\text{F}$ . Three different feed mixtures ranging in composition from 70 per cent carbon dioxide and 30 per cent hydrogen to 20 per cent carbon dioxide and 80 per cent hydrogen were studied at six different space times ranging from 0 to  $8 \times 10^{-5}$  hours. An additional feed mixture containing 13 per cent of the product methane was studied at three space times ranging from .7 to  $3 \times 10^{-5}$  hours.

An individual run consisted of passing a given feed mixture over a given amount of catalyst maintained at a given constant temperature by a jacket of boiling Dowtherm and analyzing the resulting product gas after steady-state conditions had been

\* Microfilm copy of complete manuscript of 140 pages, \$1.75. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-125.

attained. A constant rate of volume through-put was maintained in all runs, space time being varied by changing the amount of catalyst. A given charge of catalyst was used for a series of six runs covering the temperature range in 50° F increments for a given feed composition.

Methane and water were the principal products of the reaction, and near equilibrium conversions were attained at the higher temperatures and higher space times. Negligible amounts of carbon were formed, and at no time was the concentration of carbon monoxide in the product gas greater than 3.5 per cent.

The average rates of methane formation, obtained by differentiation of the data, varied from 0 to 5.60 lb mols/day/lb catalyst. These rates could be correlated satisfactorily by assuming that the surface reaction between an adsorbed carbon dioxide molecule and at least two adsorbed and dissociated hydrogen molecules was rate-controlling. The following two equations represent the extremes of the range of acceptable mechanisms and reproduce the data almost equally well.

Method A:

$$r = \frac{C_1(p_{\text{CO}_2}p_{\text{H}_2}^2 - p_{\text{CH}_4}p_{\text{H}_2\text{O}}^2/K_1p_{\text{H}_2}^2)}{(p_{\text{H}_2}^{1/2} + C_2p_{\text{CO}_2} + C_3)^5}$$

Method B:

$$r = \frac{C_1'(p_{\text{CO}_2}p_{\text{H}_2}^4 - p_{\text{CH}_4}p_{\text{H}_2\text{O}}^2/K_1)}{(p_{\text{H}_2}^{1/2} + C_2'p_{\text{CO}_2} + C_3')^9}$$

where

$r$  = rate of methane formation expressed in lb mols/day/lb catalyst

$p_{\text{CO}_2}$ , etc. = partial pressure of  $\text{CO}_2$ , etc., expressed in atm.

$K_1$  = equilibrium constant of the reaction  
 $\text{CO}_2 + 4\text{H}_2 = \text{CH}_4 + 2\text{H}_2\text{O}$  expressed in  $\text{atm}^{-2}$ .

$C_1, C_1', C_2$ , etc. = constants at any given temperature which were evaluated by the method of least squares and were found to vary with temperature in accordance with accepted theory.

The average deviations of the calculated rates from the experimental rates varied from  $\pm .15$  and  $\pm .17$  for Methods A and B, respectively, at 500°F to  $\pm .40$  and  $\pm .50$  for Methods A and B, respectively, at 750°F.

The calculated rates of methane formation for each feed mixture and for each temperature were integrated to give the

partial pressure of methane in the product gas as a function of space time. The average deviations of the partial pressures of methane predicted by Methods A and B varied from the partial pressures of methane obtained experimentally from minimums of  $\pm 0.0037$  atm and  $\pm 0.0049$  atm, respectively, at  $500^{\circ}\text{F}$  to maximums of  $\pm 0.0096$  atm and  $\pm 0.0107$  atm, respectively, at  $650^{\circ}\text{F}$ .

### NATURAL CIRCULATION VELOCITIES IN A LONG TUBE VERTICAL EVAPORATOR

(Publication No. 2407)\*

Bruce Frederick Harvey, Ph. D.  
University of Michigan, 1951

This is a study of the effect of various operating variables on the velocity of natural circulation in a long tube vertical evaporator. The evaporator was altered so that the natural circulation velocity could be measured directly with a rotameter. In addition, fixed thermocouples were installed in the center of one of the tubes in order to obtain the average fluid temperature.

Two types of flow were observed emerging from the tops of the tubes. At low overall temperature differences ( $\Delta T_0$ ), a pulsating or "slug" flow occurred, which may be likened to that which takes place in an ordinary coffee percolator. At high overall temperature differences ( $\Delta T_0$ ), a steady or "streaming" flow occurred. There was a transition between these two types of flow at approximately a  $30^{\circ}\text{F}$  overall temperature difference.

Several methods of plotting the data were attempted but no correlation was found. However, the data on the overall boiling section coefficients were slightly lower than those of Brooks (18).

One-dimensional equations for two-phase flow were developed in an effort to provide a theoretical explanation of steady flow in an evaporator tube. By means of this development the peak temperature in the evaporator tube could be predicted within an average error of  $\pm 3\%$  as long as the exit conditions did not approach those for critical flow. In the region of critical flow the peak temperature could be predicted within an average error of  $33\%$ . The reason for these discrepancies might be that one or more of the basic assumptions used in the development had broken down at critical flow.

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\* Microfilm copy of complete manuscript of 139 pages, \$1.74. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-151.

A tentative method for predicting the natural circulation velocity was presented, based on the plots presented in the body of this work rather than on accurate correlations.

# HEAT TRANSFER, FRICTION AND VELOCITY GRADIENTS IN ANNULI CONTAINING PLAIN AND FIN TUBES

(Publication No. 2415)\*

James George Knudsen, Ph. D.  
University of Michigan, 1950

A brief review is given of the past work which has been done on convection heat transfer and pressure drop in annuli containing both plain and transverse fin tubes. The form of empirical equations is developed by which it is hoped to correlate experimental data on annuli. A discussion of velocity profiles and mechanics of flow in annuli leads to equations which permit analysis of velocity distribution data.

Experimental equipment was built for the determination of heat transfer coefficients and pressure drops for water flowing in annuli containing both plain and transverse fin tubes. The range of Reynolds numbers investigated was from 1000 to 70,000. Apparatus was also built to determine velocity profiles in annuli and to study flow patterns in annuli containing transverse in tubes.

A friction factor plot is presented which represents all pressure drop data. An individual curve is given for each tube tested and the position of these curves relative to each other is consistent with the value of  $V_f/V_{FF}$  for each annulus. This term is an expression of the amount of fluid which is in motion between the fins compared to the total amount of fluid in the annulus.

An equation for the calculation of heat transfer coefficients on fin tubes in annuli is given, namely

$$\frac{h_E D_E}{k} = 0.039 \left( \frac{D_E V^e}{\mu} \right)^{0.87} \left( \frac{C \mu}{k} \right)^{0.4} \left( \frac{S}{D_E} \right)^{0.4} \left( \frac{W}{D_E} \right)^{-0.19}$$

This equation takes into consideration the fin height and the fin spacing. There are indications that the applicability of the above equation is limited to fin height to fin spacing ratios in the neighborhood of unity.

\* Microfilm copy of complete manuscript of 383 pages, \$4.79. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-159.



Turbulent flow, isothermal and non-isothermal velocity profiles in an annulus containing a plain tube are presented. These profiles reveal that for the isothermal, turbulent flow the point of maximum velocity is the same as for isothermal streamline flow. For non-isothermal turbulent flow the point of maximum velocity moves towards the inner tube. Turbulent flow velocity profiles in annuli containing fin tubes reveal that the point of maximum velocity is shifted toward the outer pipe of the annulus.

A study of the flow patterns occurring between the fins is presented. This study indicates that heat transfer coefficients can be explained qualitatively on the basis of the flow patterns. Also, the type of flow pattern between the fins can be predicted from the fin height to fin spacing ratio in both two-dimensional and three-dimensional models.

A comparison of the heat transfer performance of all tubes tested showed that fin tubes are superior to plain tubes. In power performance, the arrangement of the fin surface is of importance and only certain arrangements are superior to plain tubes. In volume performance, all fin tubes are superior to plain tubes.

#### THE CONCENTRATION OF THE STABLE ISOTOPE OF SULFUR OF MASS 34

(Publication No. 2440)\*

Edward David North, Ph. D.  
University of Michigan, 1951

The purpose of this investigation was to develop the chemical exchange method for concentrating the stable sulfur isotope of mass 34 by constructing the first column of a multiple column unit. The column constructed supplied data such as the effect of pressure, flow rates, and temperature on the height equivalent to a theoretical plate. These data may be used in the design of the multiple column unit.

The system studied was the sulfur dioxide-bisulfite ion system. The reaction may be written:



\* Microfilm copy of complete manuscript of 101 pages, \$1.26. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-184.



The apparatus consisted of a 70 foot saran column two inches in diameter filled with one-quarter inch porcelain Raschig rings. A saturated solution of sodium sulfite was fed to the top of the column where it reacted with sulfur dioxide in the column to form sodium bisulfite. 2.8 normal sulfuric acid was added at the bottom of the column to liberate sulfur dioxide from the bisulfite solution.

The sulfur isotope of mass 34 concentrated at the bottom of the column.

The column was operated at 20°C and 50°C and at 300 mm mercury and 740 mm mercury absolute pressure. The separation factor,  $\alpha$ , for the system was found to be 1.014 at 20°C and 1.013 at 50°C. The height equivalent to a theoretical plate (HETP) varied from 3.68 feet at 740 mm mercury and 20°C to 2.21 feet at 740 mm mercury and 50°C. The HETP values at 300 mm mercury ranged from 3.13 feet to 2.35 feet.

It appears that mass transfer is the rate controlling step in the column with about 85% of the resistance to mass transfer in the liquid phase. It is expected that lower HETP values will be obtained for the same packing at higher temperatures. Lower HETP values should be obtained with smaller packing such as Fenske helices, etc.

The cost of producing 90%  $S^{34}O_2$  by chemical exchange using the present apparatus is estimated to be 60% of the thermal diffusion cost.

#### EFFECT OF VAPOR AGITATION ON BOILING COEFFICIENTS AT LOW TEMPERATURE DIFFERENCES

(Publication No. 2366)\*

Donald Baker Robinson, Ph.D.  
University of Michigan, 1950

A small horizontal tube and shell refrigeration cooler has been designed and constructed for purposes of studying the effect of vapor agitation on boiling coefficients. Recirculated water was used for the heating fluid and Freon 12 was used as the boiling liquid. Heat transfer measurements were made on four individual 3/4 in. O.D. plain copper tubes placed on 1-1/2 in. centers in a vertical row.

\* Microfilm copy of complete manuscript of 139 pages, \$1.74. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-110.

The effect of one tube on another on the boiling coefficients was studied for boiling film temperature differences from  $5.4^{\circ}\text{F}$  to  $19.5^{\circ}\text{F}$  at heat fluxes from 874 to 35,100 BTU/hr. sq. ft. The effect of vapor artificially injected beneath the tube bundle was studied on all four tubes for three different conditions, and on the single bottom tube for boiling temperature differences from  $8.27^{\circ}\text{F}$  to  $18.35^{\circ}\text{F}$  at injection rates from 0 to 235 cu. ft/hr. The coefficient was found to increase by 218% at a boiling temperature difference of  $6^{\circ}\text{F}$  and 0% at a temperature difference of  $18.35^{\circ}\text{F}$ .

The effect of the surface on boiling coefficients was observed over a period of 32 days. During this period the coefficients changed to about 67% of their original value at low temperature differences and about 39% at higher temperature differences.

An equation in which the Reynolds number appears to the 0.88 power has been determined from the experimental data for calculating water coefficients inside the tubes. The Wilson plot method has been used to calculate boiling coefficients at two different conditions.

A satisfactory method of installing thermocouples in thin-walled copper tubes has been described in detail.

#### THE EFFECT OF FORCED CIRCULATION RATE ON BOILING HEAT TRANSFER AND PRESSURE DROP IN A SHORT VERTICAL TUBE

(Publication No. 2457)\*

Joseph Louis Schweppe, Ph. D.  
University of Michigan, 1950

This is a study of the effect of turbulence on heat transfer to boiling water. Heat transfer from a metal wall to liquid flowing inside a tube was considered for three different tube diameters — 0.438 inches, 0.622 inches, and 1.049 inches. The length of the heated section was 8.53 inches.

The results indicate a significant influence of both heat flux and liquid velocity, although a considerably smaller effect by velocity than was implied by the rather crude measurements of Austin long ago. The equipment was operated at velocities of 3 to 25 feet per second during the course of the investigation. The range of heat flux was 36,000 Btu/hr ft<sup>2</sup> to 205,000 Btu/hr ft<sup>2</sup>.

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Heat transfer coefficients of 2,000 Btu/hr ft<sup>2</sup> °F to 9,000 Btu/hr ft<sup>2</sup> °F and  $\Delta t$ 's of 6 °F and 46 °F were obtained. Throughout the tests, the inlet liquid temperature was maintained within a few degrees of the boiling point.

The data show that the Reynolds Number of the entering liquid is not an adequate criterion for the influence of turbulence upon boiling film coefficient. A strictly empirical expression in which an incremental increase in mass velocity to correct for the influence of specific surface and length-to-diameter ratio is presented. No claim to generality of this function is made.

A maximum pressure drop across the heated section was observed at a velocity of 200 to 300 lb(mass)/sec ft<sup>2</sup>. This velocity corresponds to the maximum discharge rate for steam-water mixtures inside pipes at the experimental exit conditions. Pressure drops as high as 20 lb/in<sup>2</sup> were observed in the 5 inch length of pipe between the outlet of the heater and the vapor space.

It was concluded that, although the increase in coefficient caused by an increase in liquid rate is substantial, the accompanying increase in pressure drop would probably make the very high velocities not feasible except for special applications. The logic of the current trend toward repressing boiling in the heated section of forced-circulation evaporators is confirmed by high non-boiling coefficients with corresponding low pressure drops.

A maximum discharge rate for steam-water mixtures was encountered, and a corresponding peak pressure drop across the test section was found. Extrapolation of this gradient to the discharge leaves a large pressure differential between the predicted outlet pressure and the vapor space.

#### THE DRYING OF GRANULAR SOLIDS IN SUPERHEATED STEAM

(Publication No. 2474)\*

Leonard Andrew Wenzel, Ph. D.  
University of Michigan, 1950

The effects of variations in steam pressure, temperature, and flow rate, in bed depth, and in sand particle size on the drying behavior of beds of Ottawa Sand saturated with water and subjected to an atmosphere of flowing superheated steam are studied.

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The drying sample, 12 inches wide, 30 inches long, and 1, 2, or 3 inches deep, and consisting of 20-28 Mesh, 80-100 Mesh, or 115-170 Mesh Ottawa Sand, is hung from weighing devices in the center of a rectangular 5" x 14" duct. Superheated steam at pressures from 25 to 100 psia, temperatures from 303 °F to 380 °F, and at flow rates varying from 196 lbs/hr. ft.<sup>2</sup> to 4820 lbs/hr. ft.<sup>2</sup> are passed over the sample, and the sample weight is recorded continuously. This sample weight vs. time data is then differenced to give the drying rate as a function of the moisture content of the sample.

The drying rate vs. moisture content curves so obtained are found to closely parallel those obtained for drying the same materials in air. After an initial adjustment period, a period during which the drying rate remains constant is observed, followed by a period during which the drying rate decreases.

The drying rates during the constant rate period vary from 0.175 lbs/hr. ft.<sup>2</sup> to 1.275 lbs/hr. ft.<sup>2</sup> These are expressed in terms of the rate at which heat must be transferred to the drying surface to supply the required heat of vaporization. These heat transfer coefficients, corrected for radiation effects and for heat transferred by conduction through the walls of the sample pan are correlated by the equation:

$$\frac{h_c}{c_p G} \left( \frac{c_{pH}}{k} \right)^{2/3} = 18.8 \left( \frac{LG}{\mu} \right)^{0.65}$$

The results of tests in which water was evaporated into air and into superheated steam agree with the results obtained when drying sand beds in superheated steam.

The moisture content present at the end of the constant rate period is found to depend upon the thickness of the drying sample and upon the drying rate during the constant rate period. The following equations represent the data obtained:

$$\text{for 1" bed depth, } W_c = .024 + .034 R_c;$$

$$\text{for 2" bed depth, } W_c = .032 + .034 R_c;$$

$$\text{for 3" bed depth, } W_c = .048 + .034 R_c.$$

The drying rate — moisture content data obtained during the falling rate period is represented by a straight line extending from the critical point to the end of the drying process.

These results are used to compare from an economic standpoint the drying of sand beds under several conditions using superheated steam and air as drying media.

## CHEMISTRY

### HYSTERESIS OF CONTACT ANGLES STUDY OF INTERFACIAL CONTACT ANGLES IN MERCURY-WATER-BENZENE SYSTEMS

(Publication No. 2382)\*

Carl W. Bjorklund, Ph. D.  
University of Michigan, 1951

It is almost always possible, for any given system, to obtain a range of apparently stable contact angles the values of which vary between two fairly wide but definite limits. This is known as the "hysteresis effect." A study was made of the interfacial contact angles formed by water drops at mercury-benzene interfaces in order to determine the extent to which a hysteresis effect might occur within this system, and, if possible, to obtain an explanation for the phenomenon. The fluidity of the mercury substrate minimized the effect of surface roughness which is generally believed to contribute to the hysteresis effect. Furthermore, the use of mercury made it possible to determine the interfacial tensions existing at each of the interfaces within this system. Knowing the values of these tensions, it was possible to calculate the values of the interfacial angles which should be expected.

The study of hysteresis of contact angles in the mercury-water-benzene system was found to require very accurate control of the rate of expansion or contraction of the water drop. A sessile drop apparatus was developed to provide such control. For a given drop it was possible to add or to withdraw liquid at a uniform rate through a fine glass capillary, the tip of which could be left in the drop while contact angle measurements were made.

The interfacial tensions were measured by the pendent drop method. The results obtained by this method, as it is now developed, have a high degree of precision. Measurements can, moreover, be made over almost any desired time interval. Accordingly, the method was used to determine the interfacial tensions, and the changes in these tensions with time, for each of the three interfaces in the system being studied.

Hysteresis of the contact angle was found to occur in this system. The length of time that the liquid phases had been in contact before the angle measurements were made was the most

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predominant factor responsible for the different contact angle values which were observed. Similarly, the magnitudes of the interfacial tensions at mercury-water and at mercury-benzene interfaces were found to depend upon the ages of the respective interfaces at the time that the tension measurements were made.

The magnitude of the observed contact angle was shown to depend upon the relative magnitudes of the interfacial tensions operating within the system. The spontaneous alteration with time of the observed contact angle was caused, at least in part, by the spontaneous decrease with time in the value of one or more of the interfacial tensions. Evidence indicated that the magnitude of the interfacial contact angle formed by a drop was determined primarily by the magnitudes of the free energies existing at the interfacial areas immediately adjacent to the periphery of the drop. It was found that the magnitude of the free energy at such an interfacial area (adjacent to the drop periphery) might differ temporarily from the magnitude of the free energy at the remainder of the interface. Hysteresis of the contact angle could thus be observed, because true equilibrium conditions were found to be attained but slowly.

#### THE REACTION OF ISOBUTYLENE OXIDE WITH SOME ALKYLMAGNESIUM BROMIDE SOLUTIONS

(Publication No. 2333)\*

Robert George Brault, Ph. D.  
Michigan State College, 1948

The addition of one or one-half molecular-equivalent of 1,2-epoxy-2-methylpropane to one equivalent of alkylmagnesium bromide leads to the opening of the oxirane ring and the reaction of the magnesium-bromine bond. The products formed are: 1-bromo-2-methyl-2-propanol, 2-methyl-1-propanal, and the secondary alcohol resulting from the reaction of 2-methylpropanal and excess Grignard reagent. When the Grignard reagent does not react with 2-methylpropanal, the trimer of the aldehyde is formed. When equimolecular quantities of reactants were used there was some reduction of the aldehyde to 2-methyl-1-propanol.

The addition of two molecular equivalents of 1,2-epoxy-2-methylpropane to one of ethylmagnesium bromide or propylmagnesium bromide leads to the reaction of the magnesium-bromine

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bond with the formation of 1-bromo-2-methyl-2-propanol, 2-methylpropanol, and a relatively small yield of 2-methyl-3-pentanol or 2-methyl-3-hexanol. The trimer of 2-methylpropanal is formed in quantity. There is at the same time reaction of the alkylmagnesium bond with the formation of 2-methyl-2-pentanol or 2-methyl-2-hexanol.

## THE REACTIONS OF o-AZIDOBIPHENYLS

(Publication No. 2384)\*

Bernard Beau Brown, Ph. D.  
University of Michigan, 1950

Aryl azides decompose with loss of nitrogen under the influence of heat, light, or strong acids. It was proposed to investigate the mechanism of these reactions by studying a series of aryl azides possessing such structural features as to enable two competitive paths of decomposition to yield different ultimate products.

o-Azidobiphenyl satisfied the requirements in that 2-amino-5-bromobiphenyl was formed by acid-catalysed decomposition with hydrogen bromide in glacial acetic acid, and carbazole was formed by exposure to heat or ultra-violet radiation. The series of o-azidobiphenyls studied and the products obtained are presented in the table. All of the azides were prepared from the corresponding amine by diazotization and treatment with sodium azide. The thermal decompositions were carried out in dilute solution in a variety of solvents such as kerosene or 1,2,4-trichlorobenzene, and generally commenced around 180°; the photochemical decompositions also proceeded best in solution.

Treatment of the azides with hydrogen bromide gave rise either to an amine, with or without bromination, or to recovered azide. When bromination occurred, the entering bromine atom was always found ortho or para to the original azide group except when these positions were blocked, in which case conversion of the azide group to an amine occurred without bromination; free bromine was the other product in this case. The presence of two nitro groups anywhere in the molecule rendered it inert to hydrogen bromide.

When a nitro group was ortho to an azide group thermal and photochemical decomposition led to a furoxan, otherwise

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substituted carbazoles were always formed. Thermal cyclization was not interfered with by such neutral hydrogen-doners as tetralin and benzyl mercaptan.

The cyclization of o-azidobiphenyls to carbazoles appears to be a new reaction and constitutes a method of synthetic value for the preparation of a variety of carbazoles, some difficult obtainable or not at all by other methods. The attempted extension of the cyclization reaction to the formation of some six-membered heterocyclic systems, such as phenazine and phenoxazine, was unsuccessful.

Substituted 2-Azidobiphenyl	M.P.	Substituted 2-Aminobiphenyl from HBr Decomp.	Yield	Substituted Carbazole from Thermal Decomp.	Yield
2-Azidobiphenyl	49-50°	5-bromo	82%	Carbazole	76%
5-bromo	49-50°	3,5-dibromo	72%	3-bromo	83%
3,5-dibromo	89-89.5°	3,5-dibromo	97%	1,3-dibromo (m.p. 106°)	74%
5-nitro	85-87°	3-bromo-5-nitro (m.p. 139°)	87%	3-nitro	88%
3,5-dinitro	118-119°	recovered azide		4-phenyl-6-nitrobenzofuroxan (m.p. 212°)	83%
5,4-dinitro	174-175°	recovered azide		3,7-dinitro (m.p. 325°)	94%
4,4'-dinitro	177-178°	recovered azide		2,7-dinitro (m.p. 335°)	91%
4'-nitro	92.5-93.5°	5-bromo-4'-nitro 3,5-dibromo-4'-nitro	75% 25%	2-nitro	85%
3-nitro	62.5-63.5°	3-nitro-5-bromo (m.p. 118°)	57%	4-phenylbenzofuroxan (m.p. 88°)	55%
2'-nitro	80.5-81.5°			no cryst. product	
2-Azido- diphenyl Ether	36-37°	2-Amino-5-bromo diphenyl Ether	60%		
N-Acetyl-2-Azidodiphenyl- amine	113-113.5°				

Melting points of new compounds only are recorded.

## ADHESIONAL FORCES AT PHASE BOUNDARIES

(Publication No. 2395)\*

George Franklin Dasher, Jr., Ph. D.  
University of Michigan, 1950

This investigation is concerned with the relation between the composition of two phases and the energy released at their common boundary as they come together. Such boundaries fall into two general classifications: (1) the boundary between two condensed phases and (2) the boundary between a condensed phase and a gas. It was necessary to treat each of these classifications separately.

General equations for each type of boundary were derived from consideration of the formulations proposed by London and others for the energy resulting from the interaction of the Van-der Waals forces between molecules. The equation for the first type of boundary,  $\phi_I = c\xi$ , linearly relates the energy,  $\phi_I$ , released in the formation of a boundary between a given condensed phase and each of a series of immiscible phases, to a property of these phases its  $\xi$  value. The quantity  $\xi$  is defined by the re-

lation  $\xi = \frac{n_D^2 - 1}{n_D^2 + 2}$  where  $n_D$  is the index of refraction of the phase

for the D line of sodium. The  $\xi$  value is equivalent to the polarizability per unit of volume. The equation for the second type of boundary,  $\phi_{II} = k\xi^2$ , linearly relates the energy change attendant to the formation of the boundary to the  $\xi^2$  value of the liquid.

The first equation was experimentally tested by the use of free energy of formation data for the interfaces between (1) mercury and various liquids (2) water and non-miscible organic liquids, (3) carbon and various liquids, and (4) a stibnite and various liquids. It was further tested by the use of total surface energy of formation data for the interfaces between (1) charcoal and various liquids and (2) for silica gels and various liquids. The second equation was experimentally tested by the use of data for the total surface energies of various pure liquids and also by the data for the free surface energies of various pure liquids.

Experimental verification of the applicable equation was obtained at each of the boundaries considered. As an example, after empirical evaluation of the constant as applicable to a mercury interface, it was possible to use the general equation for the prediction of the interfacial tension of a given liquid

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against mercury. Predicted values were, in most cases, found to be within the limit of experimental error.

It was found possible to relate directly the energy change which occurs at a phase boundary to a specific property of the bound phase, namely, its polarizability per unit of volume. Prior to this research no such generalization has been reported.

CATALYSED EXCHANGE, ISOMERIZATION, AND  
HYDROGENATION OF THE *n*-BUTENES WITH  
THE ISOTOPIC HYDROGENS

(Publication No. 2340)\*

Vernon Hamilton Dibeler, Ph. D.  
Columbia University, 1950

The rate constants and activation energies have been determined for the initial stages of isomerization, exchange and hydrogenation of 1-butene, *cis*-2-butene and *trans*-2-butene. The results are discussed with regard to the dissociative, associative, and hydrogen-switch mechanisms previously proposed for these reactions. The observation that the initial rates of isomerization and exchange of 1-butene are nearly equal is in disagreement with the results of an earlier study by Twigg. The interconversion of the *cis* and *trans* isomers of 2-butene could not be accomplished in the absence of hydrogen at the temperatures studied. The interconversion in the presence of hydrogen, however, showed rate constants and activation energies nearly equal for both protium and deuterium. The observed rate constants and activation energies for the exchange and hydrogenation of the *cis* and *trans* isomers are assumed to be those of near equilibrium mixtures as a result of the rapid interconversion of these isomers. The effect of varying the pressure of the reactants in the isomerization, exchange, and hydrogenation of 1-butene indicates a dependence on approximately the square root of the pressure of both olefin and hydrogen for nearly equal amounts of reactants. A large excess of hydrogen makes the reactions first order with respect to olefin while a large excess of olefin apparently poisons the catalyst. For initial stages of the reactions the ratio of rate constants for protium-induced isomerization and hydrogenation vary from 2.3 to 135° C. to approximately 1.0 at 60° C. The ratio of deuterium-induced isomerization and exchange

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is approximately 1. and nearly constant over the same temperature range. The lower limit for the ratio of the rate constants for protium addition and deuterium addition is estimated to be 85. This suggests that the addition mechanism differs from that of the isomerization-exchange.

## THE ELECTRODEPOSITION OF COPPER-LEAD ALLOYS

(Publication No. 2458)\*

Nelson William Hovey, Ph. D.  
University of Michigan, 1950

As the result of numerous preliminary experiments involving sixteen different solutions containing both copper and lead compounds, a cyanide-tartrate solution was selected for intensive study. The compounds used were sodium cyanide, cuprous cyanide, sodium potassium tartrate, sodium hydroxide, and lead acetate. The effects of changes in concentration of each of these compounds were determined by the following measurements: (1) the static potentials of the individual metals against the solution, (2) the dynamic potential of the alloy at various times during the electrodeposition, (3) the static potential of the alloy against the solution and (4) analysis of the deposit.

These measurements led to the formulation of a plating solution of the following composition: sodium cyanide 147.0, cuprous cyanide 150.6, sodium potassium tartrate 211.7, sodium hydroxide 40.0, and lead acetate 75.9 g/l. The effects of (1) replacing sodium ion by potassium ion, (2) replacing tartrate ion by citrate ion, (3) altering the pH, (4) adding ammonium hydroxide, (5) diluting the solution, and (6) nineteen different addition agents were studied. None of these produced any significant improvement in the quality of the deposit although all except the addition agents altered its composition.

Increasing the rate of cathode rotation and increasing the temperature increased the copper content of the deposits while increasing the current density decreased it, but none of these variables was critical. The optimum conditions were 20 amp./sq. ft. (2.2 amp./sq. dm.), 80°C. and 3000 r.p.m.

The solution as formulated gave deposits containing approximately the desired 70% copper but by modification of the solution, alloys of any composition could be produced. Reproducibility

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of alloy composition using a freshly prepared solution was entirely satisfactory. However, an aging effect leading to lower percentages of copper was observed.

Thin deposits (0.001 inch) were bright and smooth but thick deposits tended to be nodular. All high copper content alloys were hard and brittle.

Copper anodes were used in most of the work, but a limited study of the anode process indicated that alloy anodes would be satisfactory.

### INFLUENCE OF OXYGEN ON THE APPARENT MOLAR REFRACTION AND VOLUME OF METHYLENE GROUPS IN ALKYL CHAINS

(Publication No. 2452)\*

Omer E. Robbins, Jr., Ph.D.  
University of Michigan, 1950

The first four members of each of four homologous series, where the variable, normal alkyl group R is attached to an oxygen, were prepared and carefully purified. The four series are symmetrical  $C(OR)_4$  and  $Si(OR)_4$  as well as  $ROCH_2CHOHCH_3$  and  $ROCH_2CH_2COOCH_3$ . The density and refractive index for four visible helium lines were measured, and molar refraction, dispersion and volume calculated. From the latter quantities, the molar increments  $RCH_2$  of refraction,  $DCH_2$  of dispersion and  $VCH_2$  of volume were obtained for successive methylene groups.

The increment  $RCH_2$  for the methylene group involved in the difference  $OC_2H_5$  minus  $OCH_3$  was found in the four series to have values ranging between 4.70 and 4.73 cc. They are larger than those of the increments  $OC_3H_7$  minus  $OC_2H_5$  and  $OC_4H_9$  minus  $OC_3H_7$ , the average of which is  $4.635 \pm 0.01$ . In general, the Et-Me increment  $DCH_2$  seems to be higher than the next one, but in no case did the difference exceed the estimated experimental error.

The absolute values of the increment Et-Me for the four series approach the "high" values found by Beth Cook (1948) in the series  $GeR_4$ , in which the increments alternate between "high" and "low" values. The high increments are therefore

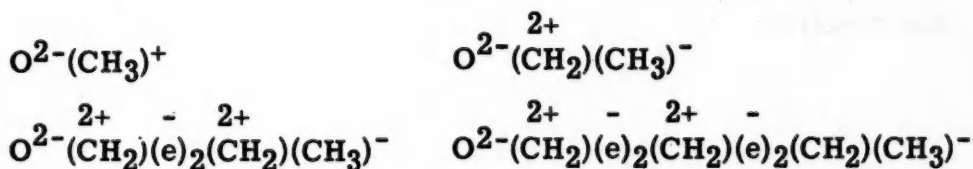
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considered to be due to the same change,  $(\text{CH}_2)^{2+}(\text{CH}_3)^-$  minus  $(\text{CH}_3)^+$ , in the quantum configuration of the methyl group, which was assumed by Fajans and Cook for alternating series.

The  $\text{RCH}_2$  increments Pr-Et and Bu-Pr in the four series are either equal to or differ little and in an unsystematic manner from the value 4.64 found in normal hydrocarbons. Hence, they are considered to be due to the addition of the grouping  $(\text{CH}_2)^{2+}(\text{e}^-)_2$  to the chain, and their small variations as well as those of the Et-Me increments are interpreted as due to polarization effects.

Based on these experimental results and theoretical conclusions, which are substantiated by the parallel behavior of the  $\text{VCH}_2$  increments, the probable quanticule formulations for the methoxy through the butoxy groups common to the four series investigated are



The explanation of the above and other deviations from additivity of the molar refraction on the basis of the factors embodied in the quanticule theory of molecular structure, recently developed by Fajans and associates, is shown to be more satisfactory than other methods of treating refraction data.

#### THE PREPARATION AND CHARACTERIZATION OF THE DIPHENYLMETHANES PREPARED FROM MONOCHLOROBENZYL CHLORIDE AND ORTHO AND PARA CRESOL

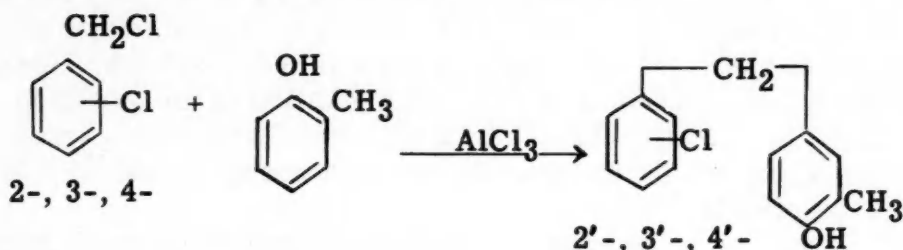
(Publication No. 2024)\*

Kenneth Robert Robinson, Ph. D.  
Michigan State College, 1950

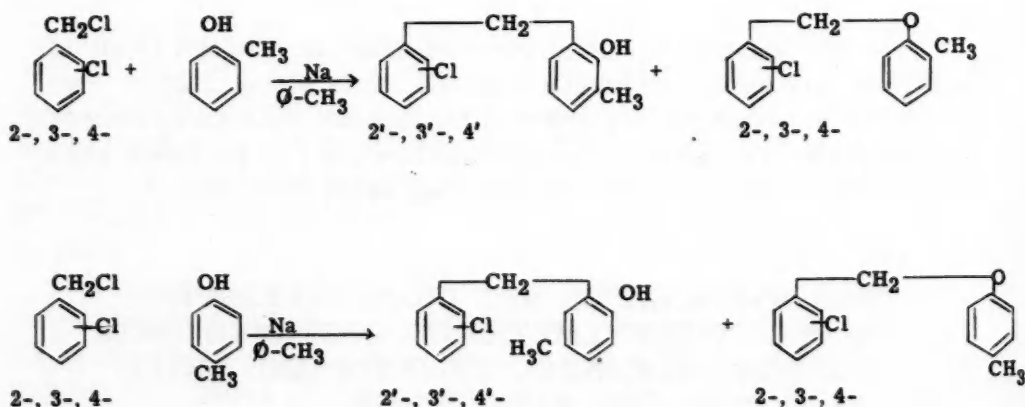
This investigation was undertaken in order to extend a series of diphenylmethanes prepared in this laboratory. The preparation of nine hydroxy-methyl-chloro'-diphenylmethanes is described.

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Two methods of direct alkylation of o- and p-cresol were used. When the condensation was carried out using acidic conditions (aluminum chloride), p-alkylation of o-cresol took place.



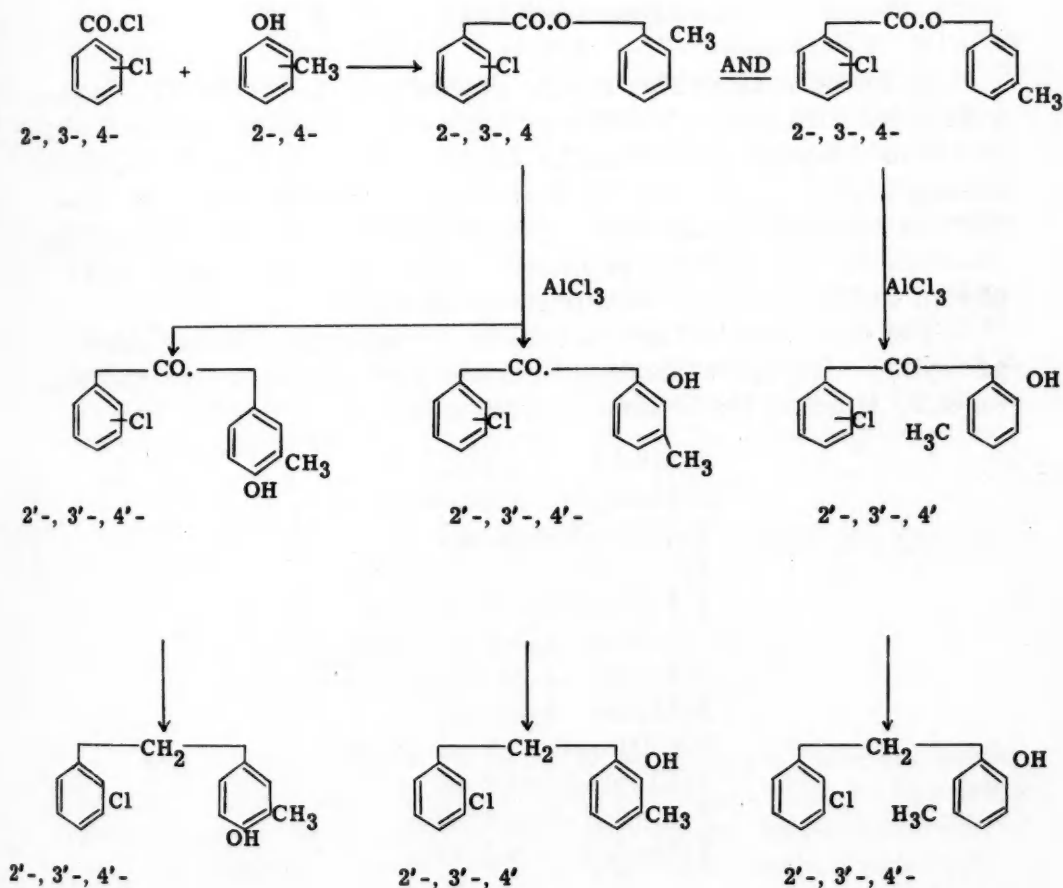
However, if basic conditions were used in a "non-dissociating" solvent, only o-alkylation occurred. [L. Claisen and E. Tietze, Ber., 58B, 275 (1925); Ber., 59B, 2344 (1926)]. The corresponding ethers were also produced as side-products in this reaction.



The ethers produced in the above reactions were also synthesized by allowing the appropriate chlorobenzyl chloride to react with o- or p-cresol in a sodium hydroxide-ethyl alcohol medium.

It was found that if xylene was used as the solvent as suggested by W. B. Wheatley et al. [J. Am. Chem. Soc., 71, 64 (1949)], instead of the lower boiling toluene, the yields of both the diphenylmethanes and ethers were substantially increased in many cases.

In an indirect method of preparation of these hydroxy-methyl-chloro'-diphenylmethanes, the following series of reactions were used:



The aluminum chloride rearrangement K. Fries and G. Finck, Ber., 41, 4271 (1908) of the o-cresyl esters gave predominantly the 4-hydroxy-3-methyl-chloro'-benzophenones as was expected. The reductions were carried out using the Huang-Minlon J. Am. Chem. Soc., 68, 2487 (1946) modification of the Wolff-Kishner reaction. In all cases but one, the products obtained were the same as those prepared by direct alkylation procedures. Reduction of 2-hydroxy-5-methyl-2'-chlorobenzophenone gave 2-methylxanthene.



A STUDY OF THE REDUCTION AND FRAGMENTATION OF  
SOME TERTIARY CARBINOLS WHEN CONDENSED WITH  
BENZENE IN THE PRESENCE OF ALUMINUM CHLORIDE

(Publication No. 2334)\*

Robert Verne Smith, Ph. D.  
Michigan State College, 1949

In 1945 Dr. Goerner, of this laboratory, condensed 3-Ethyl-3-hexanol with benzene in the presence of aluminum chloride and isolated a fraction which he tentatively identified as 3-Ethyl-hexane formed apparently by reduction of the alcohol. This reduction phenomena had been noted in previous work involving the condensation of aryl and arylalkyl carbinols with benzene and phenol in the presence of aluminum chloride.

The following tertiary alcohols having only primary alkyl groupings attached to carbinol carbon were prepared by various modifications of the Grignard synthesis.

2-Methyl-2-heptanol  
3-Methyl-3-heptanol  
3-Ethyl-3-hexanol  
2,4-Dimethyl-2-hexanol  
2,4-Dimethyl-4-hexanol  
2,5-Dimethyl-2-hexanol  
2-Methyl-2-hexanol  
3-Methyl-3-hexanol  
2,4-Dimethyl-2-pentanol  
3-Ethyl-3-pentanol  
2-Methyl-2-pentanol  
3-Methyl-3-pentanol

Tertiary amyl and tertiary butyl alcohols were obtained from the stockroom of C.P. grade. The 3,5-Dinitrobenzoates of these alcohols were prepared and analyzed for nitrogen.

The above alcohols were condensed with benzene in the presence of anhydrous aluminum chloride, hydrolyzed, dried and fractionated under the same set of conditions. The mole ratio of carbinol, benzene and aluminum chloride used for each condensation was 1:5:0.5 respectively.

Fragmentation was shown to take place only with those alcohols having branching on the beta carbon atom. Cission of the

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alkyl group always took place at such a point as to favor direct formation of the isobutyl group, which was isolated in the form of isobutane and tert-butylbenzene. Branching on the gamma carbon atom is apparently too far removed from the positive carbon to effect fragmentation.

Reduction was shown to take place during the condensation as evidenced by the isolation of the paraffin hydrocarbon corresponding to the structure of the alcohol condensed and also isobutane in those cases exhibiting fragmentation. The paraffin hydrocarbons were identified by their physical constants and infra-red spectrograms, alkylbenzenes by their physical constants with the exception of tert-butylbenzene which was identified also by its acetamino derivative. Isobutane was identified by its boiling point and refractive index at  $-25^{\circ}\text{C}$  and p-Di-tert-butylbenzene by its 2,6-Dinitro derivative.

Possible mechanisms were proposed for the fragmentation and reduction phenomena. It was shown in previous work that the presence of an aromatic nucleus is necessary for reduction to take place. Reduction seemed to be enhanced considerably when tert-butyl chloride was substituted for tert-butyl alcohol.

## THERMODYNAMICS OF ADSORPTION FROM SOLUTION

(Publication No. 2468)\*

Tudor Lloyd Thomas, Jr., Ph. D.  
University of Michigan, 1950

Until very recently practically no attempts had been made to investigate adsorption from solution with a view to acquiring a fundamental understanding of the process. In recent investigations initiated in this laboratory, attempts were made to interpret adsorption from solution at solid and at air interfaces according to the concept of multilayer adsorption. The BET equation which was originally derived for the adsorption of gases was shown to be also applicable to adsorption from solution. The purpose of the present investigation was to obtain a deeper insight into the mechanism of this process of adsorption from solution and to make a thorough analysis of the thermodynamics involved.

A complete thermodynamic formulation for the energy changes involved in adsorption from solution was developed.

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The effects of the transfer of the adsorbate from the bulk phase to the adsorbed film and of the attendant change of the free surface energy were treated individually throughout this development. The heat of wetting of a solid surface by a pure component was also studied from a thermodynamic point of view. It was shown that it is necessary that a surface be completely evacuated before wetting in order that reproducible and valid results may be obtained.

A kinetic model for the mechanism of adsorption from solution was developed. The probable structure of the adsorbed layers in the surface phase and the mechanism for the displacement of solvent molecules from the surface phase by the adsorption of solute molecules was postulated. Evidence was obtained indicating that adsorbed films are under compression.

Adsorption isotherms at three different temperatures were determined interferometrically for the adsorption of *n*-propyl alcohol and *n*-butyl alcohol from aqueous solution on both graphite and blood char. Temperature was shown to affect the adsorption in a manner consistent with (1) the heat of adsorption and (2) the temperature coefficient of solubility of the adsorbate. For solutes of low solubility (1) predominates at low concentrations and (2) at high concentrations. For solutes of high solubility (1) predominates throughout the entire concentration range.

The BET constants,  $c'$ ,  $(x/m)_m$  and  $n$  were calculated for each of the twelve isotherms and their temperature dependence was analyzed. Evidence was obtained which strengthens and justifies the extension of the use of the BET treatment for adsorption from solution.

The heats of adsorption from solution over a limited concentration range were determined calorimetrically for the four alcohol-water systems showing two effects which had not previously been observed: (1) a minimum of heat evolved at low concentration and (2) a maximum at a higher concentration for solutes of limited solubility. An interpretation based on the compression of the surface film and the saturation of the adsorbed solution was attempted.

The observed differential heats were compared with the isosteric differential heats calculated from the adsorption isotherms at different temperatures. It is observed that such calculated heats were not in agreement with the observed heats.

By considering the adsorption process as a distribution of the adsorbate between the bulk solution and the surface phase, the standard free energy and heat content changes,  $\Delta F^0$  and  $\Delta H^0$  respectively, were calculated from the adsorption data.

A method based on the Boltzmann distribution principle was used for the calculation of the number and composition of

the adsorbed layers. The number of adsorbed layers thus calculated always exceeded the numerical value of the BET constant  $n$  as obtained from the Joyner-Weinburger-Montgomery plots of the adsorption data. A kinetic model for the surface phase was proposed on the basis of such calculations.

### THE REACTION OF PROPYLENE OXIDE WITH VARIOUS ALKYL MAGNESIUM CHLORIDES

(Publication No. 2025)\*

Harlan E. Tiefenthal, Ph. D.  
Michigan State College, 1950

This investigation has extended the studies that have been conducted on the reactions of various alkylmagnesium halides with ethylene oxide, propylene oxide and isobutylene oxide. It involved the preparation of several Grignard reagents and corresponding dialkylmagnesium compounds, together with their subsequent reactions with propylene oxide using various proportions and conditions.

Grignard reagents were prepared using ethyl-, *n*-propyl-, sec-propyl-, *n*-butyl-, sec-butyl-, iso-butyl, and tert-butyl chlorides. Yields were determined by the Gilman [Gilman, H., Wilkinson, P. D., Fishel, W. P. & Meyers, C. H., J. Am. Chem. Soc., 45, 150 (1923)] titration.

Each Grignard reagent was treated in four ways:

1. One mole of Grignard reagent was reacted with one mole of propylene oxide without heating.
2. One mole of Grignard reagent was reacted with one mole of propylene oxide and then refluxed with benzene.
3. One mole of Grignard reagent was reacted with two moles of propylene oxide without heating.
4. The dialkylmagnesium compound was made from the Grignard reagent and was reacted with two moles of propylene oxide without heating.

Reactions 1 and 2 were allowed to stand over night before hydrolysis. Reactions 3 and 4 were allowed to stand until they gave a negative Michler's ketone test [Gilman, H. and Schulze, F.,

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PERCENT YIELDS OF ALCOHOLS AND 1-CHLORO-2-PROPANOL

Grignard reagent prepared from	RMgCl+ $\text{CH}_3\text{CHCH}_2$		RMgCl+ $\text{CH}_3\text{CHCH}_2$		RMgCl+ $2\text{CH}_3\text{CHCH}_2$		R <sub>2</sub> Mg+ $2\text{CH}_3\text{CHCH}_2$	
	without heat		without heat		without heat		without heat	
	Percent 1-chloro- 2-propanol	Percent Alcohol	Percent 1-chloro- 2-propanol	Percent Alcohol	Percent 1-chloro- 2-propanol	Percent Alcohol	Percent Alcohol	
1-Chloroethane	35	37	40	42	73	56	60	
1-chloropropane	50	28	35	31	64	62	19	
2-chloropropane	55	23	53	30	81	46	34	
1-chlorobutane	52	41	28	58	77	59	26	
2-chlorobutane	54	10	24	16	69	30	9	
1-chloro-2-methyl- propane	58	19	19	40	73	62	33	
2-chloro-2-methyl- propane	65	0	3	25	61	15	0	



J. Am. Chem. Soc., 47, 2002 (1925)]. The ether solutions of the products of reactions 1, 2, and 3 were refluxed with sodium hydroxide to decompose any 1-chloro-2-propanol present. Analysis for chloride ion concentration was made by the Volhard method. The ether layers from all reactions were dried over potassium carbonate and fractionated through a helices packed, Fenske type column.

The physical constants of the alcohols were determined and the 3,5-dinitrobenzoate derivatives prepared.

A comparison of the results of this investigation with those obtained from the reaction of propylene oxide with alkylmagnesium bromides [Huston, R. C. and Bostwick, C. O., J. Org. Chem., 13, 331 (1948)] showed that:

1. In the 1:1 mole ratio reactions:
  - a. when heat was not used, the chlorine activated the alkyl-magnesium bond to give higher yields of alcohol, and,
  - b. when a benzene reflux was used, the chlorides gave improved yields of the secondary alcohols.
2. In the 1:2 mole ratio reactions:
  - a. the yields of the alcohols and 1-halo-2-propanols were increased in both cases and,
  - b. these yields were essentially the same for the corresponding alkyl group.

## CHEMISTRY, PHARMACEUTICAL

### ANTISPASMODICS. XI

(Publication No. 2400)\*

John Andrew Faust, Ph. D.  
University of Michigan, 1950

The principal object of this investigation was the preparation of basic-alkyl esters, particularly  $\beta$ -diethylaminoethyl esters, of certain types of acids for pharmacological evaluation as antispasmodic agents. The acids were of the following general types:

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Aryl-substituted acetic acids in which a halogen atom or a substituted amino group was present in the  $\alpha$ -position, for example,  $\alpha$ -bromophenylacetic acid and  $\alpha$ -dimethylaminophenylacetic acid.

Aryl-substituted propionic acids which contained one or more hydroxyl groups, for example,  $\beta$ ,  $\beta$ -diphenyllactic acid or  $\beta$ ,  $\beta$ -diphenylglyceric acid, or an epoxy group, such as  $\beta$ ,  $\beta$ -diphenylglycidic acid.

Aryl-substituted acrylic acids such as  $\alpha$ ,  $\beta$ ,  $\beta$ -triphenylacrylic acid.

Incidental to the preparation of certain of the basic-alkyl esters, three derivatives of morpholone-2 were obtained.

The substituted acetic acids were not isolated; their basic-alkyl esters were prepared by means of several different procedures, and these procedures are described fully in the Experimental Part. The Darzens glycidic ester condensation was employed frequently as the first step in the synthesis of most of the substituted propionic acids. In general, the acrylic acids were obtained from suitable propionic acids by means of various well-known reactions.

In all cases in which the free acids were isolated, their basic esters were prepared according to the Horenstein-Pählicke esterification procedure. Anomalous results were obtained by this method in the case of diphenylpyruvic acid. In other instances, the basic esters were obtained from the interaction of the acid chlorides and  $\beta$ -diethylaminoethanol. The basic esters of the substituted  $\alpha$ -aminoacetic acids were prepared by amination of the basic esters of the corresponding  $\alpha$ -haloacetic acids.

The derivatives of morpholone-2 were all prepared by the heat-cyclization of the appropriate basic-alkyl esters of  $\alpha$ -haloacetic acids.

During the course of this investigation, seventeen basic-alkyl esters of the above-mentioned types of acids, three morpholone-2 derivatives, one basic-alkyl ether of an ester, and a derivative of a basic-alkyl amide were obtained and submitted for physiological tests. As far as we are aware, none of these compounds has been described hitherto. In addition, other related compounds were prepared, and certain of their reactions were studied.

Only two of the compounds have been shown to exhibit high antispasmodic activity when tested on the isolated rabbit's intestine.

DERIVATIVES OF QUINOLINE-3-CARBOXYLIC ACID  
AND BENZO(f)QUINOLINE-2-CARBOXYLIC ACID

(Publication No. 2401)\*

James Edward Gearien, Ph. D.  
University of Michigan, 1950

The therapeutic value of the alkaloids of ergot is well known. However, the high cost of ergot, its uncertain supply and the low yield of alkaloids are some of the disadvantages which can be overcome only by the discovery and use of a satisfactory synthetic substitute. One of the constituent alkaloids, widely used because of its oxytocic properties, is ergonovine, the 2-(1-hydroxy)-propylamide of lysergic acid. The acid consists of a condensed system which is composed of a partially hydrogenated benzo(f)quinoline-2-carboxylic acid and a pyrrole ring.

The object of this investigation was the preparation of modified fragments of the ergonovine molecule, in the hope that these simpler substances might exhibit oxytocic activity. Originally, it was planned to prepare hydroxyalkyl amides of quinoline-3-carboxylic acid, benzo(f)quinoline-2-carboxylic acid and 6- and 7-aminobenzo(f)quinoline-2-carboxylic acid. In the amide of 7-aminobenzo(f)quinoline-2-carboxylic acid, the position of the amino nitrogen is the same as that occupied by the nitrogen atom of the pyrrole nucleus in lysergic acid. All the rings in these compounds are aromatic, and in this respect they are different from the ergonovine nucleus. However, because of difficulties encountered in the synthesis of benzo(f)-quinoline-2-carboxylic acids, the hydroxyalkyl amides of these compounds were obtained only in the form of their 1-hydroxy derivatives.

The simplest modified fragment of the ergonovine molecule prepared was the 2-(1-hydroxy)-propylamide of quinoline-3-carboxylic acid. In addition, the 2-(1-hydroxy)-butylamide and the dihydrochloride and methobromide of the diethylaminoethyl ester of quinoline-3-carboxylic acid were synthesized.

Catalytic hydrogenation of ethyl quinoline-3-carboxylate formed a compound which was probably ethyl 1,4-dihydroquinoline-3-carboxylate. The latter ester was converted into its hydrazide, azide, amide and acid.

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Several attempts were made to obtain benzo(f)quinoline-2-carboxylic acid. 1,3-Dihydroxy-2-methylbenzo(f)quinoline was prepared and treated with phosphorus oxychloride to form 1,3-dichloro-2-methylbenzo(f)quinoline. This substance was converted to 2-methylbenzo(f)quinoline by catalytic hydrogenation. Attempts to oxidize this compound to benzo(f)quinoline-2-carboxylic acid and to oxidize 2,3-dimethylbenzo(f)quinoline to benzo(f)quinoline-2,3-dicarboxylic acid failed. It was hoped that the latter compound could be converted to benzo(f)quinoline-2-carboxylic acid by partial decarboxylation.

Pure 1-hydroxybenzo(f)quinoline-2-carboxylic acid was prepared but the hydroxyl group could not be removed from this substance.

Since we were unable to obtain benzo(f)quinoline-2-carboxylic acid, 1-hydroxybenzo(f)quinoline-2-carboxylic acid was converted into the 2-(1-hydroxy)-propylamide and into the  $\beta$ -diethylamino-ethyl ester. When the latter acid was treated with diazomethane, in the expectation that the methyl ester would be formed, a product which seemed to be methyl 4-methylbenzo(f)-1-quinoline-2-carboxylate was produced.

The ethyl esters of 1-hydroxy-6-amino- and 1-hydroxy-7-amino-benzo(f)quinoline-2-carboxylic acid were prepared, and these esters converted into the corresponding 2-(1-hydroxy)-propylamides which were isolated as their hydrochlorides. For the synthesis of the esters it was necessary to prepare 10 and 9 intermediates, respectively. It was also necessary to develop new syntheses for 3-nitro-1-naphthylamine and 6-nitro-1-naphthylamine which were used as intermediates.

None of the compounds showed appreciable oxytocic activity.

#### SYNTHETIC ANALGESICS. CYCLIC ANALOGS OF AMIDONE

(Publication No. 2417)\*

John Krapcho, Ph. D.  
University of Michigan, 1950

The object of this investigation was the preparation of cyclic analogs of the analgesic Amidone.

In view of the fact that the piperidine ring in morphine, and in Demerol, is an essential feature of these analgesics, it seemed

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that piperidine compounds, derived from Amidone (4,4-diphenyl-6-dimethylamino-3-heptanone) and related substances, might exhibit high analgesic activity. The cyclic analog of Amidone which was prepared is 1,2,6-trimethyl-4,4-diphenyl-3-piperidone.

The complete synthesis of a 3-piperidone is illustrated in the case of 1-methyl-4,4-diphenyl-3-piperidone. Interaction of 2-dimethylaminoethyl chloride and diphenylacetonitrile, in the presence of sodamide, yielded 2,2-diphenyl-4-dimethylaminobutanenitrile. Treatment of the latter nitrile with methylmagnesium iodide produced 3,3-diphenyl-5-dimethylamino-2-pentanone. The hydrobromide of the ketone was brominated with the formation of 1-bromo-3,3-diphenyl-5-dimethylamino-2-pentanone hydrobromide. After treatment of the hydrobromide with ammonia water, the free base cyclized rapidly to 1-methyl-4,4-diphenyl-3-piperidone methobromide. When the methobromide was heated under reduced pressure, methyl bromide was evolved, and 1-methyl-4,4-diphenyl-3-piperidone was obtained.

By use of the proper disubstituted acetonitrile, basic alkyl halide and Grignard reagent in the above reactions, it was possible to obtain 1-methyl-3-piperidones with substituents in any of the 2, 4, 5 and 6 nuclear positions. Ten new 1-methyl-3-piperidones, including the cyclic analogs of Amidone and Isoamidone, were prepared by this synthesis. All of these compounds were purified as hydrochlorides. Four of the 3 piperidones were reduced to their respective alcohols. Two of the alcohols were converted into acetates, and one to a p-aminobenzoate. Most of the 3-piperidones were tested pharmacologically. None of them exhibited high analgesic activity, and several were quite toxic to mice.

It was found that 1-methyl-4-bromoacetyl-4-phenylpiperidine hydrobromide, on treatment with ammonia water, yielded 3-keto-4-phenylquinuclidine methobromide. Unfortunately, this methobromide did not decompose at its melting point with the evolution of methyl bromide. The ketone methobromide was readily reduced to the alcohol, and the latter substance, on treatment with acetic anhydride and pyridine, produced 3-acetoxy-4-phenylquinuclidine methobromide.

An isomer of Isomidone, 1-dimethylamino-2-methyl-4,4-diphenyl-3-hexanone hydrochloride, was obtained by interaction of 4,4-diphenyl-3-hexanone, formalin and dimethylamine hydrochloride, in the presence of acetic acid. When 3,3-diphenyl-2-pentanone was utilized as a starting material in the Mannich reaction, 1-dimethylamino-4,4-diphenyl-3-hexanone hydrochloride was formed.

Nitriles, such as 2,2-diphenyl-4-dimethylaminobutanenitrile, could be hydrolyzed readily to their respective acids when they



were refluxed with 48% hydrobromic acid. The use of this hydrolytic reagent, in place of concentrated hydrochloric acid, eliminated the necessity of a sealed tube at elevated temperatures. During an attempt to convert 2,2-diphenyl-4-dimethylaminobutyric acid into the acid chloride, by treatment of the acid with thionyl chloride, 1-methyl-3,3-diphenyl-2-pyrrolidone was obtained in good yield. The ease of preparation of the necessary acids from the nitriles, and also the rapid cyclization of the acid chlorides makes this procedure an advantageous one for the preparation of substituted 2-pyrrolidones.

### CYCLIC ACETALS AND KETALS. II AND III

(Publication No. 2454)\*

Edward Lewis Schumann, Ph. D.  
University of Michigan, 1950

It had been found that certain basic 1,3-dioxolanes, which had been prepared during another investigation in this laboratory, exhibit antihistamine activity. However, the most active compound, 2-phenyl-2-( $\alpha$ -thienyl)-4-diethylaminomethyl-1,3-dioxolane, was not equal to Benadryl in potency.

This investigation was undertaken in order that additional basic dioxolanes, and also basic 1,3-dioxanes, might be prepared and examined in the hope that more highly active histamine antagonists might be discovered.

Most of the desired basic dioxolanes were synthesized by amination of a bromomethyl intermediate obtained by one of the following general procedures:

(a) Azeotropic distillation of the water formed by the reaction of glycerol  $\alpha$ -monobromohydrin with the required ketone in the presence of an acid catalyst.

(b) Interaction of epibromohydrin with the required aldehyde or ketone and stannic chloride at a low temperature.

The hydroxymethyl derivative, employed for the preparation of an acid, basic ester and two basic ethers of a 1,3-dioxolane, was obtained when glycerol was heated with diphenyldimethoxymethane. The structure of this alcohol was proved by an alternate synthesis.

Intermediates for the synthesis of basic 1,3-dioxanes were obtained by three processes:

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(a) Azeotropic distillation of the water produced during the interaction of the required 1,3-diol with an aldehyde or ketone.

(b) Reaction of a 1,3-diol with a dimethyl or diethyl acetal or ketal.

(c) Direct condensation of a 1,3-diol with an aldehyde or ketone in the presence of phosphoric acid or phosphorus pentoxide.

The bromomethyl compounds, obtained by one of the procedures mentioned above, then were aminated, with the aid of sodium iodide and the required amine, to yield the desired basic 1,3-dioxane.

In conformity with their structures as cyclic acetals and ketals, the basic 1,3-dioxolanes and basic 1,3-dioxanes hydrolyze, in the presence of an acid, to yield a basic 1,2- or a basic 1,3-diol and an aldehyde or a ketone. After 2,2-diphenyl-5-methyl-5-piperidinomethyl-1,3-dioxane had been in contact with aqueous hydrochloric acid for some time at room temperature, benzophenone and 2-methyl-2-piperidinomethyl-1,3-propanediol (as the di-(phenylurethane)) were isolated from the mixture in 99% and 95% yield, respectively.

During this investigation twelve new basic 1,3-dioxolanes and twenty-seven new basic 1,3-dioxanes were synthesized. All of the basic compounds, except one, were characterized by the preparation of one or more of the following salts: hydrochloride, acid oxalate, picrate or methiodide. In addition, two new non-basic 1,3-dioxolanes, 2,2-diphenyl-4-hydroxymethyl-1,3-dioxolane and the corresponding 4-carboxy derivative, and twenty-nine new non-basic 1,3-dioxanes which were used as intermediates, were isolated.

Up to this time, only fifteen of our products have been examined pharmacologically. Only one of the compounds tested, 2,2-diphenyl-5-methyl-5- $\beta$ -diethylaminoethoxymethyl-1,3-dioxolane hydrochloride, exhibited a fair degree of activity; it was about one-half as potent as Benadryl.

THE ANALYSIS OF HIPPED-PLATE STRUCTURES  
WITH INTERMEDIATE DIAPHRAGMS

(Publication No. 2413)\*

Pao-Chyuan Huang, Sc. D.  
University of Michigan, 1950

This paper presents both theoretical analysis and experimental results on hipped plate structures with intermediate diaphragms. A hipped plate structure, which consists of thin flat plates connected monolithically with one another at various angles, is a space structure usually covering large areas. Many papers have been published discussing such structures without intermediate diaphragms, in which the cross sections are subjected to distortion because the span is large and the plate elements are thin. This distortion modifies considerably both the longitudinal and transverse strains and consequently a more complicated solution is necessary. The installation of intermediate diaphragms in a hipped plate structure tends to keep the cross section from changing shape, which permits the application of the ordinary beam theory.

The ordinary beam theory is based upon the assumption that there is a negligible distortion of the cross section due to the presence of intermediate diaphragms. Then the longitudinal stresses in the structure can be obtained by the ordinary flexural formula and the restraining forces acting on the diaphragms which are necessary to keep the cross section from being distorted can be obtained by application of Castigliano's theorem after the longitudinal stresses are known. A general solution which involves trigonometric series is also presented in this paper for those hipped plate structures with many intermediate diaphragms and where the loads are unsymmetrical with respect to both axes. In this analysis, which includes the torsional effect, the stress distribution method which was introduced by Winter and Pei in 1947 is used in a modified form to obtain the longitudinal stresses.

The design of the intermediate diaphragms involves two problems: the spacing and the proportions of the intermediate diaphragms. The spacing of intermediate diaphragms depends upon the material, dimensions, and shape of the roof structure, and, of course, the proportion and stiffness of the intermediate

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diaphragms. In Chapter IV an approximate method is given to determine the proper spacing of intermediate diaphragms so that the methods presented in Chapter III can be applied safely and an example is given to explain the procedures of determining the proportions of an intermediate diaphragm.

An aluminum hipped plate roof model was employed in the experimental work. Two solid wood diaphragms were inserted at the third points to prevent distortion of the cross section and the model was loaded at the third points both symmetrically and then eccentrically with respect to the longitudinal axis. The experimental results compare satisfactorily with the theoretical values in all cases.

For the symmetrical case, the plane of the roof cross section remained a plane after the load was applied; that is, the unstrained fiber was close to the calculated neutral axis and the magnitudes of the stresses matched those obtained by the flexural formula which was applied to the whole structure as a beam.

These facts affirm the use of the ordinary beam theory, which gives a direct and simple solution to a complex hipped plate structure.

## DEFLECTION METHOD FOR ARCH ANALYSIS

(Publication No. 2423)\*

Wen Fa Lu, Sc.D.

University of Michigan, 1951

In the conventional method of arch analysis, the displacement of the arch axis due to strain is neglected. In an arch rib of long span, however, considerable deformation will occur and the design by the conventional method will involve appreciable error. To obtain correct results, the deflection theory, which considers the deformed configuration of the arch axis, must be used. The fundamental theory of the subject was developed many years ago by German writers, and many contributions have since been made by later investigators. Their methods, however, are either too complicated or restricted to some simple cases of loading.

This paper presents a simple and accurate method of analysis for flexible arch ribs, developed for a symmetrical parabolic axis, applicable to both fixed-end and two-hinged types.

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The cross section is assumed to be either constant or variable, in which the moment of inertia and area of rib vary with the secant of the slope of arch axis. A permanent load is assumed to be uniformly distributed over the entire span and a uniform live load to occupy any part of the span. The temperature effect is also considered.

The differential equation of vertical deflection is solved by means of Fourier series. From the three conditions of consistent elastic deformations, the three redundant reactions in a fixed-end arch are determined. By simply dropping the terms due to the fixed ends, the equations are reduced to the case of two-hinged arches. The series involved in the equations converge so rapidly that the first few terms will give results with a satisfactory degree of accuracy. A positive procedure is suggested for the solution of the transcendental equation for  $H$ .

To eliminate the bending stresses on account of the effect of rib shortening, the arch axis is often adjusted or cambered for the dead load and possibly also a part of the live load. The proposed method has also been extended to the analysis of fixed-end and two-hinged arches built from the cambered three-hinged arches.

In the analysis, the horizontal component of deflection is neglected, as was done in most other deflection methods. However, a study is made of the probable errors involved in this assumption and formulas are derived to make the corrections. The buckling of arches is briefly discussed on the basis of theoretical predictions supplemented by experimental results done by others.

Several illustrative examples are given to show the method of calculation. The same examples are also solved by the conventional method and by various other deflection methods. Since the assumptions made and the equations solved are more or less the same in all the deflection methods, their results agree rather closely. As compared with the conventional method, the deflection theory is found to yield an average increase of 50 per cent in moment in certain cases.



**RELATING THE SHEARING STRENGTH OF CLAY SOILS  
TO THE BEARING CAPACITY OF CLAY FOUNDATIONS**

(Publication No. 2455)\*

**Ahmad Mohamad Shaaban, Sc.D.  
University of Michigan, 1951**

This work deals exclusively with the cohesive or clay soils. It was mainly designed to determine the bearing capacity of clay foundations in terms of the shearing strength of the clay material. For the determination of the bearing capacity load tests were used. The method used for conducting load tests calls for applying the load in increments, each increment to be maintained for a certain period of time during which settlements are recorded to picture the soil behavior under increased loading. To take care of the effect of the size of the bearing area on the bearing capacity, three sizes of plates were used for each set of tests. Round, square and long plates with a common width were also used.

The load test results were analyzed by two different methods; the yield value method, based on the principle of plastic solids and the analytic method, in which is made use of the bearing capacity equation relating the bearing capacity to the size of the bearing area. The shearing strength was determined by the unconfined transverse shear test.

Denoting the shearing strength by "S," the bearing capacity obtained from the yield value method of analysis is  $6.60S$  and that obtained as the bearing capacity limit from the analytic method is  $7.73S$ . The latter value is a limiting value that must not be exceeded for safe design; while the former which is the bearing capacity at the yield point may be increased to a value depending on the importance of the structure, but not exceeding the bearing capacity limit.

Values of soil stress reactions obtained from the analytic load test analysis were used in the determination of the pressure distribution under round, square and long footings. A parabolic stress distribution was assumed, approximated from an elasticity solution by Sadowsky. Complete analysis, computations and pressure values are included.

Also investigated were the most important physical properties of the clay material, namely cohesion and curing. It was definitely established in this work that a newly mixed clay

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material will undergo a curing process that continues for weeks and probably months. It was thus concluded that no testing on a remixed clay material shall be performed before the material has completely cured. The curing period may be determined by a series of shear tests.

The effect of changing the rate of load application on the values obtained from the unconfined compression test was also investigated. It was found that within practical test periods and load applications an increase or a decrease of the rate of loading produces an increase or a decrease, respectively, in the unconfined compressive strength of the sample that is within the allowable limits of experimental testing.

### ANALYSIS OF RIBBED DOMES WITH POLYGONAL RINGS

(Publication No. 2463)\*

Tsze-Sheng Shih, Sc.D.  
University of Michigan, 1951

A dome is a structural unit that is circular or polygonal in plan; and, on a vertical section through the axis of the dome, it may be either curved or polygonal. According to the type of construction, domes may be divided into two classes: Shell Domes and Ribbed Domes. The former is made of a very thin membrane, while the latter is made with a framework consisting of ribs in the meridian plane connected with, and braced by, a series of horizontal rings. During the past twenty years, as a consequence of the fact that methods for the practical analysis of shell domes have been greatly improved over the design of ribbed domes, most of the domes built have been of the shell type in spite of its disadvantages. This paper therefore treats more exact but practical methods for the analysis of ribbed domes.

Methods of analysis of ribbed domes for both a fully symmetrical loading and also for a general load condition are presented in this paper. The members of the structure are considered to be rigidly connected as is usually the case in most practical construction. Under a fully symmetrical loading the dome is analyzed exactly by direct application of Castigliano's theorem. For a dome under general load condition the internal forces and displacements are determined by superimposing the

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effects of unsymmetrical loads on individual ribs. The solution is made by combining the cases of two corresponding opposite ribs under both antisymmetrical and symmetrical loading. In the analysis of domes under these latter loading conditions (symmetrical and antisymmetrical), auxiliary force systems are used to control translations of the joints and the numerical solution is much simplified by means of finite trigonometrical series.

The conclusions of the investigation are:

1. The effect of rigid connection at the joints is very significant; so that, if a safe and economical design in practical construction is desired, the members cannot be considered as combined with hinges.

2. For a dome under fully symmetrical load, neglect of axial strains of rings may result in a quite considerable error.

3. For a dome with two opposite ribs under antisymmetrical load, rigid body translation of the rings must be considered, while their change of shape may be neglected. This action in the structure can conveniently be analyzed by use of auxiliary force systems.

4. For a dome with two opposite ribs under symmetrical load, only the radial deformations (change in shape) are considered, and the finite trigonometrical series can be applied to simplify the procedure.

5. The methods of analysis can be applied to domes made of ribs and rings either in curved or in polygonal shape.

## ECONOMICS

### NATIONAL ECONOMIC BUDGETING IN NORWAY

(Publication No. 2343)\*

Joseph Grunwald, Ph. D.  
Columbia University, 1950

There has been a tendency in recent decades for governments to impose economic controls, of greater or lesser scope and stringency, in order to cope with the growing complexity of national economic structures. This tendency has been particularly

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accented in recent years by the distortions in economic relations caused by the two World Wars and by the rising popular demand for full employment. With the spread of these controls there has been a growing appreciation of the need for a system of national housekeeping to unify government economic decisions so that conflicting policies and undue regimentation can be avoided. The justification of the national economic budget is that it provides such a system and, at the same time, guides the government in recognizing the appropriate measures to be taken in order to forward the nation's objectives.

The Norwegian experience has been chosen as a case study because Norway has been a pioneer in the application of this technique and has, more than any other democratic country, developed it into an integral part of its governmental and economic structure.

The thesis is divided into four parts, of which the first comprises a very brief rationale and explanation of the concept of the national economic budget.

In the second part, the background material and the framework for the Norwegian national economic budget are presented, using the year 1949 as a focal point. In addition to a discussion of the administrative apparatus for the setting up of the budget document, the analysis includes a treatment of government policies as they influenced, and were influenced by the economic budget, and of the conceptual and technical aspects of budgeting (such as the social accounting system employed). It also establishes the restrictions imposed upon budgeting by the limitations of economic resources and by the nation's dependency upon trade with the rest of the world. Also, a summary of the 1949 Norwegian document is presented and discussed.

The bulk of the study is devoted to Part III, which involves an analysis of some of the individual budgets for 1949 of the various sectors of Norway's economy. Particular attention is given to an examination of the degree of government programming of the various accounts.

It has been necessary to consider enough of the surrounding economic environment in order to put the national budgeting process into its proper context. This has involved the treatment of such varied subjects as the relationships among the diverse economic groups, the status of statistical material, Norway's role in the world economy, and other factors within the social and economic environment.

The final part of the dissertation presents a brief critique of Norway's national economic budget and economic budgeting in general. Various points of criticism are investigated and certain aspects of the applicability of the Norwegian experience are brought to the fore.



The conclusions drawn are that the national budgeting technique is still in the experimental stage; that it serves well as an educational device for the various economic groups, fostering cooperation and a better understanding of interrelationships; and that it has great potentialities as a tool for enhancing rationality in the development and application of governmental economic policy.

### MODERN BANKING REFORMS IN CHINA, 1842-1941

(Publication No. 2349)\*

Baen Elmer Lee, Ph. D.  
Columbia University, 1950

The rapid and tremendous changes in Chinese banking since 1941 make a study of the first century of Chinese modern banking more important and interesting. The treatise covering the period from 1842, the year China's door was forced open, to 1941 when proper banking ceased to function, takes in practically the whole period of the development of the "capitalistic" banking system in China.

During the first half of the century modern banking in China was entirely in the hands of foreign banks, though Chinese native banks, especially the Shansi bankers, played an important role in helping the successful development of foreign banks. The earliest Chinese modern bank was started as late as November, 1896, while the development of Chinese modern banking gathered momentum only after the establishment of the Nationalist government in 1926.

This study is divided into three parts: I. Introduction of Modern Banking into China. II. The Development of Chinese Modern Banking. III. Banking Legislation in China.

Part I, consisting of five chapters, gives first the background when modern banking was introduced, then the development of foreign banks in China, outlining their history and reasons in favor of their success, and, finally, tells how the earliest Chinese modern banks came into existence.

Before the advent of foreign banks, the Shansi bankers were full-fledged commercial banks. They dealt in loans and discounts, deposits and remittances, bills and exchanges. Their sphere of activities extended to Vladivostok in the north,

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\* Microfilm copy of complete manuscript of 280 pages, \$3.50. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-93.



Yokohama and Tokyo in the east, Java and Singapore in the south. The issue of notes was a government prerogative.

Foreign banks under the protection of extraterritoriality were able to enjoy unrestricted freedom. They issued banknotes, imported silver coins, monopolized foreign exchanges, and later dominated Chinese finance. Their profits were huge. The Hong-kong and Shanghai Banking Corporation, for instance, was able to pay an enormous annual dividend of L8 on each share of Hong-kong \$125 from 1919-1927.

Part II, in nine chapters, treats of the development of various types of modern banking, gives a factual presentation with statistics and charts, and ends with a chapter on general features of banking during this period.

The earlier Chinese modern banks were organized and conducted after the British pattern, but after 1920, American influence was felt. Those established during the Nationalist regime adopted mostly department-store banking. All kinds of banks in China, even industrial and agricultural, were in the main commercial banks.

The influence of native banks prevailed throughout the century. Not only did they coexist with modern banks, but a large number of the clerical staff of modern banks were men trained by them.

Part III, divided into eight chapters, deals with banking legislation. The Banking Law of 1931 though promulgated was not enforced because of strong opposition on the part of bankers. An analysis of pros and cons of the controversy is presented in the study. The Central Bank was not a bankers' bank. Although introduced, rediscounting formed an insignificant part of its business. Besides issue, which was its chief function, commercial banking occupied the major part of its operations. The abolition of the tael and the adoption of "fapi" as legal tender money were important currency reforms effected shortly before the Japanese invasion. Banking control was exercised largely through ordinances by the Ministry of Finance.

The last two chapters give a summary of Chinese modern banking at the end of its first century, pointing out its defects and suggesting ways of improvement. Emphasis is laid on the necessity for better coordination of different banks in order to result in a more consolidated banking system to meet the need of postwar reconstruction.

## GOVERNMENT PRICE POLICY IN AGRICULTURE

(Publication No. 2487)\*

Jacob Oser, Ph. D.  
Columbia University, 1950

Because farmers are especially vulnerable in depressions, some sort of government program to assist them seems desirable. The criteria for judging government agricultural policy, in the order of decreasing importance, are:

1. Agricultural policy should be countercyclical.
2. The welfare needs of low income farmers should be served.
3. We should achieve an efficient allocation of resources.
4. Coercion should be minimized insofar as possible, without losing sight of the other objectives.

Price supports and crop restriction are not the best countercyclical policies. They reduce the flow of farm products to market, thereby reducing employment; the cost of agricultural raw materials used in industry is raised; large payments are made in prosperous years; the burden of high food prices falls mainly on low income groups with high propensities to consume, while the largest payments are made to big farmers who have low propensities to spend. Nor are the welfare needs of low income groups considered when food prices are kept high. The widespread destruction and diversion of food to inferior uses are not compatible with good nutrition for the nation.

Price supports reduce our volume of exports. When exports were subsidized, we invited retaliation by competing exporters. New barriers were erected by those importing countries which objected to our dumping. Cotton was partly displaced by synthetic fibers, and the use of wheat for feed was restricted. With acreage restrictions, cultivation is pushed at the intensive margin. When farm legislation restricts "basic" crops, farmers expand the output of products which are not restricted. Farmers who did not plant certain crops in a base period are barred from planting them in subsequent years if they want government assistance; when marketing quotas are proclaimed, severe tax penalties prohibit farmers from planting the crop even if they abjure government benefits.

An alternative program involves income supports to farmers. Farm prices would be freely formed on the market. In

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depression years, defined as years when unemployment averaged at least 10 per cent of the labor force, the government would make cash income payments to farmers if market prices of any crop fell below predepression levels (with adjustments for changes in prices of commodities which farmers typically buy). The flow of farm products to market would not be impeded, thereby permitting this important stabilizing force to operate to the fullest extent. To concentrate payments among the farmers who need them most and who have the highest propensities to spend, a \$20 per capita welfare payment would be offered in depression years to low income farm families as an alternative to income payments; the maximum payment per farmer would be \$1,000.

All farmers, regardless of what crops they grow, would be eligible for income payments during depressions. If the guaranteed base price results in an oversupply of a commodity (defined as excessive supplies relative to the demand for conventional uses), the government should have the authority to announce future reductions in the base price, thereby inducing the shifting of marginal resources to other uses. If soil conservation practices are desired, income payments could be contingent on the farmer's performance along these lines.

The "Brannan Farm Plan," proposed by the Administration in Washington in 1949, moves in the right direction, but several of its features seem objectionable:

1. It is not countercyclical.
2. Guaranteeing farm income up to \$20,000 of output per farm would give big farmers most of the payments.
3. It envisages output restrictions; equal percentage reductions would be imposed on small and large farms.
4. Using the last 12 years as a base would preserve war-inflated incomes for agriculture.
5. Prices for storable commodities would be supported at high levels.

APPROACHES TO INDUSTRIAL GOVERNMENT  
IN AUSTRALIA: THE ROLE OF THE ARBITRATION  
COURT IN CERTAIN INDUSTRIES

(Publication No. 2350)\*

Mark Perlman, Ph. D.  
Columbia University, 1950

This is a study of the historical development of an Australian governmental agency, of its vacillation between an emphasis on a legislative role and a judicial function, and of its relationship with certain of the large industrial groups which come within its jurisdiction. In brief, the problem is a discussion of the sources of social strength which underlie the power of the Australian (federal) Arbitration Court.

The Court's social position stems, in part, from that nation's historical culture of state responsibility and from the early reliance put on a political labor movement. In addition, the Court has adapted itself to the varying needs of the industries to which it ministers.

The Court has not had an easy time. The High Court in construing the federal Constitution strictly has limited the scope of the arbitration tribunal's powers. Parliamentary pressure has also had its effect due to the elimination of certain key powers and judicial personnel. In these ways the Court, a normal outgrowth of the Australian culture, has been shaped by the federal Constitutional developments of the past half century.

But at the same time the Court has shown that its power of survival is not alone at the mercy of the High Court and the Parliament. The Court has adapted its function to the needs and demands of the industrial parties, themselves. Where the parties are not well organized into hard-hitting economic entities, the Court has taken over much of the task of making detailed industrial decisions. This process of using extensive judicial notice (independent, thorough investigations by the judges) is termed administrative-arbitration. The history of the regulation of the Australian pastoral (wool) industry is cited to illustrate this approach in detail.

Where the parties are well organized and seem ready for bi-partite collective bargaining, the Court has resisted the temptation to have a hand in the formulation of every major decision.

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\* Microfilm copy of complete manuscript of 363 pages, \$4.54. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-94.

Instead, it has limited its activities to ruling on the issues in the precise terms presented by the litigants. This approach, emphasizing the independency of the parties from the Court, is termed autonomous-arbitration. The twenty-two year (1928-1950) history of the Australian metal trades industry is discussed in the light of the movement towards the autonomous-approach to arbitration. Several judicial faux pas are described.

In the case of the stevedoring industry, the disorganization of the employers' group (the struggle between the inter-State and overseas interests) and the politico-economic militancy of the Waterside Workers' Federation has made the Court's role a most difficult one. Here, arbitration has met one of its gravest trials.

By 1949, a year of unparalleled industrial prosperity, political radicalism had combined with militant unionism to illustrate publically the impotence of the Court when its directives were ignored. The 1949 Coal Strike is contrasted with the equally bitter 1929 Timber Workers' Strike to show the changed function of the Court. In 1929 the Court stood firm, even in the light of an "unwise" decision, and forced the recalcitrant union to give ground. Twenty-years later it was the Labor Government (not the Court) which took the lead and bore the onus of formulating the "solution."

This study is based on a historical summary of the Constitutional process as it relates to the Court (Chapter One), three industrial case studies (Chapters Three, Four, and Five), and a comparison of two National Emergency Strikes (Chapter Six). Chapter Two is a synthesis and a discussion of the Court's approaches to arbitration and the effectiveness of its powers. There are nine appendices and a selected bibliography. The work was done in Australia on a Research Training Fellowship of the Social Science Research Council.



ECONOMICS OF SOVIET RETAIL TRADE  
A STUDY IN NATIONAL ECONOMIC PLANNING

(Publication No. 2360)\*

Henry Holdship Ware, Ph. D.  
Columbia University, 1950

This study focuses upon the retail trade sector of Soviet national economic planning. The emphasis is upon function rather than upon structure or form. Our purpose is to present a descriptive analysis of the many-sided relationships which integrate retail trade into the planned economic system of the USSR; and through this concentration upon the intricacies of the retail system, we seek to provide an understanding of how national economic planning actually operates within the Soviet environment. Soviet retail trade is shown to be particularly suited to such dynamic analysis, because of its unique middle position between the nationally coordinated apparatus of planning, on the one hand, and the private retail customer of the nation, on the other.

Our inquiry into the nature of consumer choice, the ineffectiveness of consumer demand, and the specific types of market relationships and patterns for price formation, all are seen to be related directly to the basic tasks and operational bottlenecks of the Soviet economic system. The subject is presented first through a consideration of those aspects which most closely knit retailing into the unique pattern of the Soviet system. After examining the nature of prices and the composition of costs, we proceed to study the ever-present problem of commodity procurement. Then, following an exposition of the role and limits of personnel incentives, as the driving force behind the operation of retailing, we examine the characteristics of the three basic types of retail trade organization: State trade, cooperative trade, and the collective farm peasant market.

In conclusion, this study seeks to evaluate the position of the Soviet ultimate private consumer, the basic question being the extent to which he can be "educated" to demand the things approved for him, and the extent to which he can make known his wants and can expect to have them met.

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\* Microfilm copy of complete manuscript of 378 pages, \$4.73. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-104.

COMPARATIVE ACCURACY WITH WHICH NEGRO AND  
WHITE CHILDREN CAN PREDICT TEACHERS'  
ATTITUDES TOWARD NEGRO STUDENTS

(Publication No. 2373)\*

Robert Theodore Amos, Ph. D.  
University of Michigan, 1951

The aim of the present study is to compare the accuracy with which Negro and white children can predict the attitudes of their teachers toward Negroes.

The writer long has held the opinion that the feeling of rejection caused by some teachers in school situations makes Negro youths respond to attitudes toward the Negro differently from white youths. Therefore, throughout this study he has focused his attention on three related situations: (1) how the Negro pupils are perceived by their peers, (2) by their teachers, and (3) by themselves. In this connection, the following specific hypotheses were set up:

1. There will be a significant difference between the ability of the Negro and the white youths to predict their teachers' attitudes toward the Negro.

2. There will be a significant difference between the feelings of the Negro youths about themselves and their predictions of how their teachers feel about them.

3. There will be less difference between the white students and the teachers in their feelings about Negroes than between the Negro students and the teachers.

The questionnaire method was employed to secure basic information. This information was supplied by 150 ninth-grade pupils — seventy-five Negro and seventy-five white — and seventy-five teachers in three Flint (Michigan) schools.

The Likert method was followed in the construction of the attitude scale. The cross-questionnaire technique was employed in administering the scale.

Total scores were tabulated for items favorable or unfavorable to Negroes. A total score was also tabulated for both topically related and individual items. To control probable social factors, an attempt was made to equate two groups of pupils according to Cattell's proposed metric scale for the classification of subjects. The responses of these groups were then compared.

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\* Microfilm copy of complete manuscript of 152 pages, \$1.90. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-117.

The Student-Fisher t was employed to determine the significance of difference between the mean scores of the respondents of each group.

On the whole, the Negro pupils estimated the teachers' attitudes to be more unfavorable than their own. On the other hand, the white pupils perceived the teachers' attitudes to be more favorable to the Negro than their own. The white pupils predicted more accurately the attitudes of their teachers. A suggestion of a difference was discovered between the Negro and white pupils' predictions of their teachers' attitudes on the favorable items but no such difference occurred between the pupils' estimates of their teachers' attitudes on the unfavorable items. A conclusive difference was found between the self-declared attitudes of the Negro pupils and their predictions of their teachers' attitudes.

When the returns from the two socially equated groups of Negro and white children were examined, evidence was detected that social class seems to be more important than race in determining the subjects' attitudes toward their teachers. No significant difference was discovered between the estimates of teacher-attitudes by Negro and white pupils, whereas differences did emerge in other component areas.

#### RELATIONSHIP OF EMOTIONAL FACTORS IN EARLY CHILDHOOD TO SUBSEQUENT GROWTH AND TO ACHIEVEMENT IN READING

(Publication No. 2323)\*

Harriett Behm Kraemer Beck, Ph. D.  
University of Michigan, 1951

This study was to determine whether emotional maladjustments in children making slow progress in reading were caused by the reading experience, pre-existed the introduction of reading, or occurred independently of it.

Longitudinal, multi-discipline data were used for 152 long records of children studied at the Child Development Laboratories of the University Elementary School. Measurements, observations, and interviews describing physical, mental, emotional, and social development were analyzed.

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Three groups of readers — slow, fast, and intermediate — were selected on the basis of their reading ages taken at the chronological age of eleven years. The separate treatment of data for boys and girls made six groups in all. The children had attended the laboratory school at least from kindergarten through fourth grade. Graphs were constructed to show the composite growth pattern for the variables of mental age, reading age, height age, weight age, carpal age, dental age, and grip age for each of the groups. Tables were compiled to give the emotional symptoms of parent-parent conflict, parent-child conflict, feeding problem, jealousy, fears and anxiety, temper tantrums, thumb sucking, nail biting, enuresis, masturbation, and not being breast fed for each child, and for the three groups, prior to his encounter with the reading experience. Case histories of all children in the slow and fast reading groups were used to illustrate and reveal the constellation of factors in individual children in their family and school settings.

Findings were:

1. Emotional maladjustment pre-existed a child's introduction to reading in all cases of slow readers who had emotional conflict.
2. Not all slow readers were disturbed children.
3. The slow reader had three times as many categories of symptoms of emotional maladjustment as did the fast reader.
4. The fast and intermediate readers were not markedly maladjusted.
5. Qualitatively different patterns of emotional behavior were found in the three groups.
6. Three factors always present in fast readers were superior intelligence frequently bordering on a genius rating, a fast growth pattern and emotional stability.
7. Lower mental ability, a slower growth pattern, and severe emotional conflicts, as compared to the other groups in this study, were found in the slow readers.
8. The importance of the parent-parent relationship was clearly revealed in the individual case histories. In those instances where the parents were happy and compatible the child too was happy, while in those cases where the parents were unhappy the child had a pattern of definite emotional maladjustment.
9. Although differences in the father's education were not significant for the three groups of boys and girls, there was a marked difference in the educational background of the mothers of the slow and fast reading boys. Mothers of the former had much less education than those of the latter.
10. Fast girl readers tended to be tall and slender while slow girl readers were shorter and heavier.

It can be concluded that there is a marked relationship between general growth and its specific expression in reading achievement. Emotional and behavioral disturbances will have a higher incidence in the early period in those children destined to grow slowly and to achieve at a low level. Retardation in reading in some cases cannot be accounted for by the general trend and appears ascribable to environmental atmosphere and events involving emotional insecurity.

This study leaves open the question of whether there are biological determinants that make for both immature behavior and slow growth or whether alterable factors in child rearing practices retard growth and achievement and produce disturbances of affect and behavior. The slow growing child, from an early age, has a greater share of pressure and conflict than the fast growing child who is better able to meet the demands of parents, teachers, and of society. Better concepts of relating expectancy to readiness might transform this relationship of growth, achievement, and emotional security from its negative impact on the slow child into a positive program for all children.

The study suggests that much could be learned from a controlled experiment to determine the effectiveness of psychotherapy on subsequent achievement, growth and behavior.

#### AN ANALYSIS OF CONTEMPORARY THEORIES OF LEARNING WITH A VIEW TOWARD THEIR APPLICABILITY IN CLASSROOM TEACHING SITUATIONS

(Publication No. 2324)\*

Howard A. Book, Ph.D.  
University of Kansas, 1948

Educational leaders recognize that an adequate theory of learning is one of the requirements for attainment of professional teacher competence, yet conflicting points of view are evident in educational writings. This study purports to analyze current theories of learning to determine which appears to fit available data best.

In order to understand the issues involved, it is necessary to consider two distinct points of view regarding the nature of reality.

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\* Microfilm copy of complete manuscript of 296 pages, \$3.70. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-70.



One view, absolutism, assumes that there are fixed entities — absolutes. The opposite view, relativism, assumes that everything is in a continual state of flux.

One important part of the basic theory of learning which has developed under absolutistic assumptions is that learning is dependent upon a fixed condition of the synapses in the nervous system. That is, the pathways taken by neural impulses are determined by pre-existing synaptic conditions. These conditions are considered to be either inherited or acquired. The process of acquiring them is based upon the assumption that passage of a single neural impulse across a synapse produces some relatively permanent change within the synapse, and this change will in turn increase the probability that a new stimulus, representing essentially a recurrence of the original stimulus, will cause a nerve impulse to follow the identical synaptic pathway.

In contrast with this view, a relativist assumes that behavior is dependent upon a psychological field and that the pathway taken by neural impulses is determined by relationships among the various factors which make up the psychological field. Since the configuration of conditions which causes an impulse to traverse a synapse in a certain way the first time is sufficient to cause subsequent impulses to follow the same path, it is not necessary to assume that modifications in the synapse are the cause of subsequent changes in behavior.

Learning theories proposed by a majority of modern writers in educational methodology state, or imply by their discussion of learning procedures, that principles required, for the time being at least, to explain adequately all learning phenomena must be derived from these two historically opposite points of view.

Because of the conflict between the basic assumptions underlying these opposing theories, the study seeks to determine which of three positions is, in the light of available data, most acceptable. Does a consistently absolutistic view, a consistently relativistic view, or an eclectic view offer the most promise for an adequate theory of learning?

Examination of experimental data indicates that both rote-learning and learning which is more dependent upon development of meanings can be explained better by principles based on relativistic than on absolutistic assumptions. Examination of additional data indicates that the assumption that the pathway taken by neural impulses is determined by pre-existing synaptic conditions is inconsistent with available data regarding the functioning of nervous systems in learning situations. It thus becomes apparent that neither a consistently absolutistic, nor an eclectic view should be seriously considered as offering, or necessary to, an adequate theory of learning.

Moreover, a theory of learning based on relativistic assumptions is shown to be thoroughly consistent with modern theories of memory when consideration is given to experimental evidence from a wide variety of remembering situations. Furthermore, since absolutistic principles imply authoritarian control of learning situations, a theory based on relativistic assumptions appears to be more in keeping with democratic concepts.

It is, therefore, concluded that a learning theory based on relativistic assumptions offers the best approach, at the present time, to the problem of developing a theory of learning which is to serve as the psychological basis for democratic teaching.

#### GENETIC DEVELOPMENT OF MOTOR SKILLS OF CHILDREN TWO THROUGH SIX YEARS OF AGE

(Publication No. 2390)\*

Dorothy Frances Deach, Ph. D.  
University of Michigan, 1951

This study was designed to determine the genetic development of selected motor skills among children two through six years of age. The skills selected included throwing, catching, kicking, striking, and bouncing. The major purpose was to discover if there were, at each age level, discrete patterns of performance for each of the skills studied and the course of development these patterns took when viewed in terms of recognized patterns of skillful adult performance.

Forty-three girls and forty boys enrolled in the Institute of Child Welfare at the University of Minnesota were used as subjects. Motion pictures of their performance in a partially controlled situation constituted the main body of the data. Through direct observation, utilizing cinemanalysis, the elements and sequence of occurrence of motor patterns were defined; growth in accuracy and control in relation to the target was studied by means of scatter diagrams of hits. Some knowledge was gained of the relation of environment to motor behavior through information provided by a questionnaire distributed to parents. Personal data for the subjects were obtained from the school records. The scope of the study was limited by the cross-sectional

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\* Microfilm copy of complete manuscript of 401 pages, \$5.01. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-134.

approach and by the small and select number of subjects in each age group.

The results showed progression in the development of patterns from simple arm or leg action to highly integrated total body coordinations.

Throwing — From an elbow to a shoulder throw, both of an overhand type.

Catching — From an arm and body to a finger catch.

Kicking — From no backswing to one originating in the knee, then in the hip joint, and finally a full leg backswing.

Striking — From a true throw to a push with one hand and then to an actual hit, using first an overhand, then an underhand method.

Bouncing — From a single bounce to a controlled multiple bounce.

A progression composed of three basic steps was found in all hand-foot patterns from action of the primary part to opposition of movement with whole body involvement. The stages of development were comprised of simple action of arm or leg with little ability to interpret adequately the demonstration trial into the desired motor act. The advanced stages approached skillful adult performance characterized by a series of complex and integrated movements.

Age-sex variations showed that boys performed all skills with more vigor and force; that both sexes progressed to advanced stages, but the boys were about a year ahead of the girls except in the multiple bounce.

Home-play opportunities were limited and a high I. Q. seemed to have only a slight influence upon performance. The specific effect of these factors could not be determined from these data.

It was concluded that genetic development of motor skills proceeded according to laws governing physiological maturation. Patterns of performance increased in complexity and were defined in terms of stages of development rather than by chronological age. Boys were approximately one year in advance of girls and showed greater ability to move with an integrated total body pattern. The data did not give conclusive evidence of the effect of I. Q., home-play opportunities, and occupation of the father upon motor performance.

SELECTED FACTORS RELATED TO THE ACADEMIC  
ACHIEVEMENT OF PROBATIONARY STUDENTS  
GRADUATED IN 1948 FROM THE COLLEGE OF  
LITERATURE, SCIENCE, AND THE ARTS OF  
THE UNIVERSITY OF MICHIGAN

(Publication No. 2391)\*

Lawrence Melsen DeRidder, Ph. D.  
University of Michigan, 1951

This study examines the relation of certain variables to the scholastic achievement of two groups of students in the College of Literature, Science, and the Arts at the University of Michigan: (1) the 212 students who had incurred academic probation and had sufficiently raised their averages to graduate in June, 1948 and (2) an equal number of non-probationary students who had been randomly chosen according to sex from the same graduating class.

The variables selected included measures of initial characteristics, entrance data, and college success and were chosen on the basis of their potential contribution to the answering of the following questions:

1. During which semester do entering freshmen encounter failure most frequently?
2. During which semester do transfer students encounter failure most frequently?
3. Do transfer students get on probation more frequently than nontransfer students?
4. Do students who transfer from sectarian colleges experience academic difficulty more frequently than those who transfer from nonsectarian colleges?
5. How do pre- and post-service records of probationary and non-probationary students compare after their return to the University?
6. Do students in certain departments encounter failure more frequently than students in other departments?
7. What relationship exists between the American Council Psychological Examination and academic success?
8. Are students who are in the top quintile of their high school

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percentile rank placed on probation less frequently than those who are in the second quintile?

9. What effect does age at admission to the University have on the incidence of probation?

10. Is there a relationship between academic failure and age at graduation?

11. Does the incidence of academic failure differ for the sexes?

12. Does the type of housing in which students live have any effect upon their scholarship?

13. What relationship can be determined between attendance at summer school and academic probation?

To analyze the data, the statistical techniques, Fisher *t* for continuous variables and chi-square for noncontinuous variables, were used. The analysis of variance was applied to test the extent of variation between the averages of students who were living in different types of housing units.

The results indicate that men incur probation more frequently and receive more disciplinary actions per capita than women, the natives in every case being more frequently subject to discipline than transfers. Although about one-half of the first disciplinary actions were received in the first semester, academic failure occurred almost as frequently during the second semester; as a result over half of all disciplinary actions occurred during the first year of residence. It was noted, too, that probationary male students whose academic programs were interrupted by military service achieved significantly higher scholarship after their return than did non-probationary male students.

The following variables are not associated significantly with probationary status: (1) the type of control of the institution from which students transferred, (2) the effect of the type of housing, and (3) the entering and graduating ages of women.

Variables associated significantly with probationary status include: (1) the field and area of concentration, (2) the performance on the American Council Psychological Examination, (3) the quintile rank of men in their high school class, (4) the entering and graduating ages of men, and (5) the attendance at summer school.

These findings indicate that certain factors may serve to distinguish the probationary students from those who never incur probation. They also suggest that a more extensive and coordinated guidance and counseling program which would concentrate on first-year students would serve to prevent much of the academic failure and its attendant waste.



THE INFLUENCE OF SECTARIANISM, NON-SECTARIANISM,  
AND SECULARISM UPON THE PUBLIC SCHOOLS OF  
DETROIT AND THE UNIVERSITY OF MICHIGAN, 1837-1900

(Publication No. 2398)\*

Norman Drachler, Ph. D.  
University of Michigan, 1951

This study is a review of the influences of religion upon education in the Detroit Public Schools and the University of Michigan from 1837-1900. The research examines the following hypotheses: (1) Over the years covered by this study the Protestant church and its members had a distinct hegemony over public education; (2) this hegemony was expressed in a philosophy which sought to keep religion in the public schools and to keep sectarianism out; and (3) that the above policy resulted in charges by Catholics, Jews and secularists that the schools were sectarian. The Catholics used this argument to strengthen their demands for the division of school funds. The secularists held that religious education in the public schools was sectarian, unconstitutional, and would lead to community strife. They believed that complete separation of church and state was necessary for well being of the nation.

The study begins with the adoption of the first state constitution. It ends in 1900, following the decision of the Michigan State Supreme Court on the Pfeiffer Case, the only controversy over the use of the Bible in the public schools to reach the Michigan higher court.

Since public education is a state function the study first examines the legal structure of the state as it pertained to the relationships of religion and education. The debates and adopted resolutions of the first two constitutional conventions, of 1835 and 1850, which were in effect during the period covered by this study, indicate clearly that the framers of Michigan constitutions carefully provided for the separation of state and church.

The records of the Detroit Board of Education, the University of Michigan, the superintendents of public instruction, as well as other contemporary sources, reveal that educational practices associated with religious aims were often so much more firmly rooted than constitutional restrictions that a religious, often a Protestant, influence continued to prevail in public

\* Microfilm copy of complete manuscript of 174 pages, \$2.18. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-142.

education. The proponents of a religious spirit in the schools maintained that America was a Christian nation, founded upon the Bible and its teachings, and that to omit religious practices from the public schools would lead to the moral and spiritual disintegration of American civilization. In reply to charges of unconstitutionality they claimed that the constitution aimed to keep out sectarianism, not the broad principles of Christianity.

This study reveals that Michigan educators and laymen who called upon the dominant Protestant groups for a modification of the policy of religious teaching on the ground that it was in reality sectarian were correct. Their contention that non-sectarianism was really Protestantism is supported by the fact that most of the conflicts over religious teaching which arose in Michigan schools arose not over secularism, but over differences between various sects as to what constituted non-sectarianism.

The ideal of non-sectarianism was particularly difficult to achieve in Michigan, a state whose political philosophy was inspired by Jefferson and Jackson, and whose schools were administered by a people bred and raised in a New England heritage of Ezekiel Cheever and Cotton Mather. Further, this policy was made even more difficult to establish in the face of the religious viewpoints of an ever increasing population of Catholics, Jews, rationalists, and German "free thinkers." It is a tribute to Americans that the public school withstood the powerful pressures of religious groups and succeeded in finding in secularism a formula for survival and growth.

THE ORGANIZATION AND ADMINISTRATIVE OPERATION  
OF PHYSICAL EDUCATION SERVICE PROGRAMS IN  
LAND-GRANT COLLEGES AND UNIVERSITIES

(Publication No. 2330)\*

Elbridge Troy Hendricks, Ed. D.  
University of Missouri, 1951

**Purpose**

To describe the prevailing practices relative to the organization and administrative operation of physical education service programs for men in land-grant colleges and universities, and to present the opinions of authorities, where opinions have been published, regarding items considered in this study.

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\* Microfilm copy of complete manuscript of 307 pages, \$3.84. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-76.

### Method of Research

Data concerning prevailing practices in fifty land-grant colleges and universities were obtained from three sources; namely, information blanks, departmental handbooks, and general catalogues. The opinions of authorities were obtained by a review of textbooks and periodicals.

### Summary

1. The over-all physical education program was designated as a department or division in 86 per cent of the institutions and as a school or college in 14 per cent. Authorities recommend that the program be organized as a school or college in the major institutions of higher learning.

2. The service program was organized as a division of the over-all physical education program in 90 per cent of the institutions and as a separate department in ten per cent. Authorities recommend that the service program be organized as a division of the over-all physical education program.

3. In 98 per cent of the institutions the over-all physical education program was financed either wholly (78%) or partially (20%) from the institutional budget. Authorities recommend that the institutional budget represent the only source of funds for the physical education program.

4. Eighty-six per cent of the institutions reported a time requirement for the service program. Authorities recommend a time requirement.

5. Credit was given for service program courses in 76 per cent of the institutions. Authorities recommend that definite credit be given.

6. Forty institutions excused veterans from the service program requirement, and thirty-five institutions allowed other substitutions for the requirement. In general, authorities recommend that no substitutions be allowed.

7. In 90 per cent of the institutions the school physician was the only person authorized to grant excuses from the service program. Authorities recommend that excuses be granted only by the school physician.

8. Seventy-four per cent of the institutions indicated that major emphasis was placed on the recreational type activities in the service program. Authorities recommend that major emphasis be placed on the recreational type activities.

9. Seventy-eight per cent of the institutions indicated that special provisions were made for the physically handicapped student. However, only 58 per cent provided a special class. Authorities recommend that an adjusted program be provided.

10. Ninety-two per cent of the institutions indicated that

special provisions were made for guidance service in the service program. However, only 30 per cent indicated that the teachers assumed the major responsibility for guidance. Authorities recommend that the service program teachers assume the major responsibility for guidance.

#### Recommendations

In the light of the statements and data presented in this study the following recommendations are made.

1. The over-all physical education program should be organized as a school or college in major institutions of higher learning.
2. The service program should be organized as a division of the over-all physical education program.
3. The institution's budget should be the source of all funds for the physical education program.
4. All freshman and sophomore students should be required to take physical education. An elective service program should be provided for junior and senior students.
5. Definite credit should be allowed for service program courses.
6. There should be no substitutions for the service program requirement.
7. The major objectives for the service program should be to develop; namely, understandings and appreciations of, and desirable attitudes toward physical activities, activity skills, organic power, social adjustment, and emotional adjustment.
8. The service program should place major emphasis on the recreational type activities.
9. A special program should be provided for the physically handicapped.
10. The major responsibility for guidance in the service program should be assumed by the service program teachers.

## THE RELATION OF TRADE AND INDUSTRIAL SCHOOL EDUCATION TO APPRENTICESHIP TRAINING

(Publication No. 2329)\*

Garland G. Hammer, Ed. D.  
University of Missouri, 1951

### Purpose

To ascertain the opinions of certain groups of people regarding the existing and the desired relations of trade and industrial school education to apprenticeship training.

### Method of Research

The data for the study were secured through an inquiry form designed to record opinions and to elicit written statements by 960 representatives of education, management, and labor who were interested in apprenticeship training.

### Summary

An analysis of the responses and comments of the representatives of education, management, and labor concerning the relation of trade and industrial school education to apprenticeship training may be summarized as follows:

1. A need exists for a better selection of apprentices.
2. Broad differences of opinions existed among the groups and agencies concerning the value of pre-apprenticeship and pre-employment trade training. The educators strongly favored counting both pre-apprenticeship and pre-employment trade training to reduce the apprenticeship period, but management and labor opposed this practice.
3. The available technical related material for apprentices in most instances is inadequate. Its presentation is not well coordinated with on-the-job training. A system of correspondence courses or an itinerant-teacher plan should be initiated to supply related instruction to apprentices in small communities.
4. Related subjects teachers of apprentices should have trade experience and professional training as teachers.
5. A need exists for a State Supervisor in the State Departments of Education to supervise related technical instruction for apprentices in States not having this service and where justifiable. The State Department of Labor and the State Department of Education should serve apprenticeship training only in an advisory capacity.

\* Microfilm copy of complete manuscript of 268 pages, \$3.35. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-75.



6. Sharp differences of opinion existed as to whom the local supervisor of technical related instruction for apprentices should be responsible. More than two-thirds of the educators believed that such supervisors should answer to the public schools while a majority of the members of management, labor, State Apprenticeship Councils, and local joint apprenticeship committees indicated that he should report to the local joint apprenticeship committee.

7. Many respondents were undecided regarding the effectiveness with which apprenticeship training and industrial school education are coordinated on the national, state, and local levels. A majority contended that the programs were not well coordinated on the national level, while a minority said that the programs were well coordinated on the state and local levels.

8. Apprenticeship Councils established by state laws tend to improve apprenticeship training within the States.

### Conclusion

In so far as the opinions expressed in this study were the true beliefs and ideas of the respondents and the samples used were representative of the different groups involved, the following conclusions may be drawn from this study:

1. A need exists for better selection of apprentices based upon interest, aptitude, previous training, and trade experience.

2. A definite number of hours of related technical instruction should be required of apprentices in each trade. A system of correspondence courses or an itinerant-teacher plan are desirable in small communities for the dissemination of related material.

3. Supervisors of trade and industrial school education should have broad industrial backgrounds. Related subjects teachers should have trade experience in the specific trade to which the technical instruction is related, and they should be well grounded in the techniques of teaching.

4. Where feasible, a State Supervisor should be employed to supervise related technical instruction for apprentices. Both the State Department of Education and the State Department of Labor should act in an advisory capacity concerning apprenticeship training.

## INFORMAL ADULT EDUCATION IN THE Y. M. C. A. A HISTORICAL STUDY

(Publication No. 2346)\*

Alan Eddy Hugg, Ph. D.  
Columbia University, 1950

### Purpose and Scope of the Study

This study has attempted to clarify the present situation by exploring the historical development of Y.M.C.A. informal education activities with young adults. Attention has been focused on these activities in city Y.M.C.A.s of the United States with out-of-school youth and young adults. Within the scope of informal education has been considered the lectures, libraries, the literary and debating societies, and the special classes which were part of Y.M.C.A. program from the earliest years. In the later years a distinction has been made between the "formal" educational work conducted in Y.M.C.A. schools and the "informal" educational work which is administered through the program department of the Y.M.C.A.

### Method and Sources of Data

From the current literature of adult education and of educational psychology there have been adduced several "elements" of adult education method which have been used in appraising the significance of Y.M.C.A. historical developments in informal educational work. Data has been sought in the reports of Y.M.C.A. conventions, in Y.M.C.A. periodicals and educational literature, and in the literature of local Y.M.C.A.s which has been found in the Historical Libraries of the Y.M.C.A.

### Findings

Within the first decade of Y.M.C.A. work local Y.M.C.A.s had initiated lectures, "classes for intellectual improvement," special subject matter classes, literary and debating societies, and several week day and evening mission schools for youth. There was already emerging an educational point of view which recognized the importance of studying the community to discover the needs of the constituency to be served and which was becoming sensitive to the importance of an informal or permissive "climate" in achieving creative educational growth.

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\* Microfilm copy of complete manuscript of 227 pages, \$2.84. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-90.

After the Civil War, evening classes, at first of a vocational or cultural nature and later dealing with commercial subjects, increased in numbers. Also in this period the literary and debating societies increased in vitality and there was a deepening awareness of the necessity of starting any educational experience at the point where the individual is, to meet his felt needs.

In the two decades of rapid educational expansion which began in 1890, Y.M.C.A.s pioneered into a great variety of new technical education subjects. However, tendencies toward the formalization of these courses into curricula units in special Y.M.C.A. educational departments, schools, colleges and technical institutes proceeded rapidly. This same period saw the emergence in Y.M.C.A. educational thought of the first clearly formulated concepts of group work as an educational method with young adults, the phrase "group work" being applied to this type of work as early as 1909. However, these methods were not to gain a firm foothold and before 1908 educational activities in autonomous self-directed groups of young men had practically disappeared from Y.M.C.A. program.

After the first World War, city Y.M.C.A.s had to rebuild their young adult program from a fresh beginning. The social forces which accompanied the depression, led to a renewed vitality in young men's program, assisted by specialized program services and resulted in a rebirth of informal educational program on a widespread scale. However, tendencies toward a second cycle of formalization may again be found emerging.

### Conclusions

The conclusion is reached that Y.M.C.A. informal educators may be able to assure the Y.M.C.A. a unique and vital role as an informal educational agency by emphasis on self-directing learning groups who organize and manage their own educational experiences, if Y.M.C.A. program work fully capitalizes on the hundred years of experience and insight which is the unique heritage of the Y.M.C.A.

A MODIFIED USE OF THE VISUAL MOTOR GESTALT  
TEST AS A PROJECTIVE INSTRUMENT WITH  
NEUROPSYCHIATRIC SUBJECTS

(Publication No. 2420)\*

Vernon K. Lum, Ed. D.  
University of Michigan, 1951

The purpose of this study was to determine the validity and reliability of a modified use of the Visual Motor Gestalt Test as a projective instrument with neuropsychiatric subjects. The subjects were a group of sixty patients at the Veterans Administration Hospital, Fort Custer, Michigan.

The test was based on the assumption that certain signs revealed by the records are related to certain behavior characteristics. Five behavior characteristics, Anxiety, Dependency, Emotional Liability, Paranoid Trends, and Withdrawal Trends were selected for investigation, and a five point rating scale was constructed for their appraisal.

The study of reliability included three procedures: (a) a comparison between the investigator's (psychologist) first and second ratings of the test signs, (b) a comparison between the ratings of the investigator and the Veterans Administration Clinical Psychology Trainees based on the same test signs, and (c) a comparison between the psychiatrists' first and second ratings. The results indicated relatively low, but statistically significant coefficients of correlation for the ratings of both the investigator and the psychiatrists. They ranged from .45 to .63 for the investigator and from .50 to .74 for the psychiatrists. Some of the data obtained from a study of relationship between the ratings of the investigator and the Clinical Psychology Trainees suggest the probability that the interpretive skills used with the test are communicable.

In the study of validity, the ratings of the psychiatric residents were used as the criterion, and were compared with the ratings of the investigator. The ratings of the investigator were based upon "blind" \*\* interpretation of test signs. The ratings of the psychiatrists were based on all the available clinical data except the Visual Motor Gestalt Test summaries. The findings indicate only one statistically significant relationship between

\* Microfilm copy of complete manuscript of 102 pages, \$1.28. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-164.

\*\*Absence of identifying data.

the ratings of the investigator and the psychiatrists. The coefficients of .52 for Paranoid Trends is significant at the one per cent level. The remaining coefficients were: Anxiety .06, Dependency .01, Emotional Lability .06, and Withdrawal Trends .22.

The tabulation of the amount of agreement between the first and second ratings of both the investigator and psychiatrists indicated close relationships when the number of cases in which the ratings were identical were added to those ratings which differed one point plus or minus. A similar picture was found with respect to the relationship between the ratings of the investigator and psychiatrists. Moreover, a comparison of the investigator and the psychiatrists in differentiating neurotic from psychotic conditions shows an agreement of 88 per cent on the forty-one cases judged.

Although from a statistical standpoint, the amount of agreement between the ratings is almost as close by chance as it is when ratings are made by the various judges, a good case can be made for the fact that the data obtained in the percentage of agreement between ratings in the various comparisons delineates a more adequate picture of the clinical situation than that obtained by the application of standard correlation methods.

Finally, it should be emphasized that the "blind" interpretation procedure used was a concession to the experimental conditions required by the investigation. In usual clinical procedure observation of the subject's behavior during testing is an integral and important part of the total evaluation. This, and other evidence, suggest that the low coefficients of correlation obtained in this study do not indicate that the test is invalid, rather, that its validity remains to be adequately demonstrated in future investigations.

AN INVESTIGATION OF CERTAIN VALUES OF RADIO  
BROADCASTS FROM A METROPOLITAN  
SUBURBAN HIGH SCHOOL

(Publication No. 2430)\*

Mary May Maneval, Ph. D.  
University of Michigan, 1951

The purpose of this investigation was (1) to measure the extent to which an interdepartmentally-developed assembly program

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\* Microfilm copy of complete manuscript of 116 pages, \$1.45. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-174.



of radio broadcasts imparts facts to pupils within the school, to the parents of the pupils of the school, and to the alumni of the school; (2) and to measure the extent to which such a program changes the attitudes of these auditors concerning certain school practices.

This major problem is attacked through attempts to secure answers to the following sub-problems:

1. To what extent are certain facts imparted to pupils by auditing a selected assembly radio program?
2. Is such factual knowledge as is thus gained still in evidence after the lapse of a month?
3. To what extent are certain facts imparted to parents and alumni of the school by auditing a selected radio program?
4. To what extent does the school assembly radio broadcast change the attitudes of the pupils of the school, of the parents of pupils of the school, and of alumni of the school?

Two groups of senior high school pupils of the Eisenhower High School of Norristown, Pennsylvania, an Experiment Group of 596 pupils, and a Control Group of 592 pupils were formed as heterogeneous groups of tenth-, eleventh- and twelfth-grade pupils.

A group of 600 parents was selected by including the parents of the even-numbered pupils in the alphabetical file kept in the school.

A corresponding group of 600 alumni of the school, were chosen from the graduating classes of the Eisenhower Senior High School for the years 1945-1946 and 1946-1947. The first 300 names from the alphabetical list of 358 graduating seniors for 1946 and the first 300 names in the alphabetical list for the 369 graduating seniors in 1947 comprised this group.

The measuring instrument from which the data were secured was constructed in two parts: a 30-item multiple-choice test of factual knowledge about the school and its affairs, and a 30-item questionnaire for determining opinions relative to the facts covered by the test. The coefficient of reliability of .516 for the test was established with scores obtained from two groups of 100 pupils each, who did not participate in the rest of the experiment.

The answers to the separate problems of the investigation were determined from a statistical analysis of the scores on the test and the responses to the questionnaire, administered before, immediately after and one month after the broadcast.

A radio broadcast script was constructed by the investigator with pupil help. It embodied the facts covered by the test and the questionnaire.

The findings seemed to justify the following conclusions:

1. The investigation demonstrates positive values of the

school assembly broadcast for disseminating factual information to pupils. It demonstrates, also, the effectiveness of a school broadcast in disseminating information among parents and alumni.

2. Gains in factual knowledge can be effected by the use of the radio. Facts thus learned persist for at least a period of a month.

3. The results of the study fail to reveal a clear answer to the question of whether radio broadcasts are an effective medium for propaganda. The results with the Experimental Group, before and immediately after the broadcast, did reveal changes that must have been caused by the broadcast. But the results with the Control Group revealed that in the course of a relatively short time their changes of opinion were as numerous without the broadcast as were those for the Experimental Group with it. Hence no positive conclusions are justified on the basis of the data secured. The need for further researches into this problem is therefore indicated.

4. Changes of opinions were revealed on the part of the parents and alumni following the broadcast. Without controls, (which were impracticable), however, there is no basis for inferring whether or not equally numerous changes of opinion might not have occurred within a month in both groups, as in the pupil Experimental Group, if they had not heard the broadcast. Again the need for further studies is indicated.

AN ACCOUNT OF CHANGES IN THE SCHOOL OF  
EDUCATION AT THE UNIVERSITY OF MICHIGAN  
DURING THE PERIOD 1921-49

(Publication No. 2432)\*

Cameron William Meredith, Ph. D.  
University of Michigan, 1951

The purpose of this study is to provide an account of selected changes in policies, organization, offerings, enrollment, and student personnel of the School of Education at the University of Michigan during the period 1921-49. A brief account of events preceding the establishment of the School in 1921 is presented to give the reader an overview of teacher training at the University from 1859 to 1949.

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\* Microfilm copy of complete manuscript of 282 pages, \$3.53. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-176.

Policies concerning requirements for admission, certification, and graduation are reviewed. Offerings on campus and off campus such as courses, state services, publications, and cooperating activities are described. The organization of the School is analyzed. Aims and objectives, departments, programs, faculty, officers, committees, student organizations, physical plant, and budget of the School are included in the analysis. Number of students enrolled, degrees granted, teachers' certificates issued, and courses offered are portrayed by means of graphs and tables.

The character of student personnel is described for the entire period, the decades, and the late 1940's. Three groups representing distinct programs in the School were investigated: bachelors, masters, and doctors. Approximately 1,700 names of students were drawn from 14,000 graduates. Of this 1,700, a sample of 600 students representing the entire period, all students graduating in 1948-49, and all doctoral students from 1921 to 1950 are included in this analysis. Percentages were computed for all categories. To determine significance, a standardized formula for the standard error of a proportion was employed for dichotomized information while contingency tables and the chi-square test of independence were utilized for information divided into more than two categories.

The data indicate a general overall increase in enrollment reaching the highest point in the history of the School in the late 1940's. Large increases during the regular sessions were primarily responsible for this increase. From 1921 to 1949, the number of graduate students increased approximately 1,700 per cent which is 60 per cent of the total enrollment. Due primarily to the large increase in the number of undergraduate students from other schools in the University taking professional work in education, the total undergraduate enrollment increased also. However, in the late 1940's, the number of students enrolled in the School of Education was increasing rapidly because of the growing elementary teacher-training program. The number of courses offered in the general curriculums tripled from 1921 to 1949. Of the candidates receiving the provisional certificate since 1939, less than 20 per cent have received the permanent certificate. Requirements for certification have increased due primarily to expansion in the directed-teaching programs. The completion of the University laboratory schools in 1924 and 1930 provided needed plant facilities for the directed-teaching programs, classrooms, libraries, and office space. There has been little turnover in the governing faculty and a trend in the direction of a more representative and democratic

organization of the School. From 1921 to 1949 state services and cooperating activities increased significantly, and the character of student personnel within the three groups investigated remained essentially the same.

### AN EVALUATION OF THE RELATIONSHIP OF VALUES TO SOCIOMETRIC SELECTION

(Publication No. 2435)\*

Philip Harold Mitchell, Ph. D.  
University of Michigan, 1951

This study investigates the relationship between the values of 66 male college seniors in a small midwestern denominational college and the values of classmates within this group who were nominated as most desired (selectees) and least desired (rejectees) for personal association. Additional value perceptions were also explored.

One to five selectees and a similar number of rejectees were designated by each subject for each of two situations, *i. e.*, leisure and work, described on a sociometric questionnaire. Each subject completed the F Scale, a rating scale designed to measure the influence of similarity in sociometric nomination, and the Allport-Vernon Study of Values. The Study of Values was completed seven times with seven different psychological sets, *i. e.*, in the standard manner, for an ideal associate, for an extremely undesirable associate, and for each of four classmates designated as first selections and first rejections for personal association in leisure and work. Product-moment correlation coefficients were computed between the values of the subjects and the values of their sociometric nominees, and between the values of subjects and the value scores resulting from each of the six additional psychological sets. Graphs were prepared to report the influence of similarity in sociometric nomination reflected by the rating scales. The subjects were divided into three subgroups, *i. e.*, low, medium, and high, on the basis of their F-Scale scores. Separate correlation coefficients were computed between the values of the subjects and the values of the sociometric nominees for each subgroup.

Two general conclusions appear justified on the basis of the findings. (1) Values as measured by the Study of Values and as

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\* Microfilm copy of complete manuscript of 262 pages, \$3.28. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-179.



estimated by a rating scale are influential factors in sociometric nomination. (2) Values which are more dominant or higher in the value systems of the subjects exert greater influence in the nomination of personal associates than values lower in the hierarchy. The latter conclusion is somewhat comprised by the range of values among the group from which nominations were made and by the influence of tensions or emotional states in particular situations which appear temporarily to shift value relationships within the subjects' more permanent value hierarchy.

A number of additional more specific conclusions are also justified. The values of the subjects tend to be positively related to the values of desired associates and negatively related to the values of least desired associates. The subjects tend to perceive the values of desired and ideal associates as being similar to their own and the values of least desired associates and imaginary very undesirable associates as being different from their own. Subjects with low F-Scale scores tended more than subjects with higher F-Scale scores to nominate desired classmates with values similar to their own and least desired classmates with values different from their own. The subjects reported logically valid and, where data were available for measurement, empirically valid value scores under the different psychological sets.

#### INTERPERSONAL PERCEPTIONS OF STUDENT-TEACHERS AND CRITIC-TEACHERS

(Publication No. 2434)\*

Evan Gradick Pattishall, Jr., Ph. D.  
University of Michigan, 1951

The purpose of this study was to determine the interpersonal perceptions of student-teachers and critic-teachers as evidenced in their classroom practices, values and attitudes.

A questionnaire consisting of 61 items was constructed and divided into two parts, Part I, statements concerning the use of various classroom practices, and Part II, statements expressing differing educational values and attitudes. In Part I, the subjects indicated the extent to which they followed each practice by responding to a 5-point scale ranging from "always" to "never." In Part II, they marked a similar five-point scale ranging from

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\* Microfilm copy of complete manuscript of 210 pages, \$2.63. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-178.



"strongly agree" to "strongly disagree." Out of the total population of 26 critic-teachers and 106 student-teachers of a university laboratory high school, 20 critic-teachers and 97 student-teachers responded to the questionnaire for themselves. Using a cross-questionnaire technique, each critic-teacher was asked to respond to the same questionnaire for each of his student-teachers, according to the way he perceived his student-teacher, that is, he marked the scales to indicate his idea of the practices employed and values accepted by his student-teachers. Likewise, each student-teacher was asked to respond to the questionnaire indicating how he perceived his critic-teacher.

Correlation coefficients were computed comparing a separate rating of general competence given each student-teacher by his critic-teacher with the degree of perceptual congruence. This latter figure was calculated by taking the sum of the numerical difference between the response (the scale number marked) on each item by the critic-teacher responding for himself and the response he indicated for his student-teacher. In comparing differences between the student-teachers' and critic-teachers' perceptions of themselves and each other, the level of significance of the difference between the means of the responses to each item was determined by the use of the Student-Fisher "t" test.

The following results were obtained:

1. Critic-teachers tended to rate "highest" those student-teachers whom they perceived to be most like themselves, and "lowest" those student-teachers whom they perceived to be most unlike themselves in classroom practices, values and attitudes.

2. Critic-teachers perceived their "highest rated" student-teachers as exhibiting (a) more favorable and democratic traits and attitudes than their "lowest rated" student-teachers and (b) less favorable and democratic traits and attitudes than themselves. Those professing more democratic values tended to perceive their "highest rated" student-teachers as being more democratic than their "lowest rated" student-teachers.

3. Critic-teachers perceived their student-teachers as exhibiting many more unfavorable traits and attitudes, and to a greater degree, than student-teachers are able to perceive themselves as exhibiting, while student-teachers tended to perceive themselves as being more adequate in classroom practices than critic-teachers perceived themselves, and as exhibiting more favorable and more democratic traits and attitudes than were perceived by the critic-teachers.

4. Critic-teachers tended to perceive themselves as exhibiting more favorable and more democratic traits and attitudes than were perceived by the student-teachers.

5. There were more significant differences between the

way student-teachers perceived themselves and the way they were perceived by their critic-teachers, than there were between the way critic-teachers perceived themselves and the way they were perceived by their student-teachers.

Various implications were discussed.

THE DETERMINATION OF CRITERIA FOR THE  
EVALUATION OF STUDENT PERSONNEL SERVICES  
IN INSTITUTIONS OF HIGHER LEARNING

(Publication No. 2447)\*

Eric Newton Rackham, Ph.D.  
University of Michigan, 1951

This study was designed to determine criteria for the evaluation of student personnel service activities in institutions of higher learning. Development of the criteria will, in turn, assist colleges and universities in their efforts to increase the effectiveness of their programs of student personnel services.

The criteria were evolved by a series of refinements. The writer first assembled what seemed to him to be the most nearly valid principles and facts that might serve as bases for criteria by consulting all sources which seemed to have any bearing whatsoever upon any and all phases of student personnel services in institutions of higher learning. The more than two thousand principles and facts which he assembled were next consolidated into those fifteen activity areas generally considered to be the most characteristic of student personnel service programs; namely, admissions, counseling, discipline, extra-curricular activities, financial aid, health services, housing and board, organization and administration (general), orientation, placement, pre-college counseling, records, religion, research, and testing. The items were placed in check-list form and then a "pilot" study was run on the campus of the University of Colorado to refine the lists as much as possible.

A further refinement of the check lists resulted when they were submitted to appropriate officials at each of the more than one hundred institutions of higher learning in the United States whose enrollments exceed four thousand day students. These officers checked each tentative criterion for accuracy of statement of principle, checked the comprehensiveness of the various

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\* Microfilm copy of complete manuscript of 586 pages, \$7.33. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-191.

lists, and made such additions to and deletions from them as they considered desirable.

The judgments expressed by these college and university officials provided the necessary information for the construction of a rating scale of 225 items. The scale was then submitted to the scrutiny of a group of specialists carefully selected for their competence. These persons were asked to weight each item on a four-point scale ranging from Undesirable to Essential and were invited to make any needed comments. From the weights given to each item was evolved a list of "indices of value." This procedure prepared the way for the final step, the building of a Student Personnel Services Inventory.

Each criterion was turned into question form. The ascertained indices of value and derived weights were attached to each question. Opposite each question was also placed a rating scale headed thus: Never, Rarely, Sometimes, Usually, Invariably. By this means institutions can check the extent to which the aforementioned criteria are met in their respective programs of student personnel services. A profile chart has been constructed to accompany the Inventory and to make it possible for institutions to visualize their respective ratings in the fifteen designated areas of student personnel services into which the criteria have been divided.

The writer believes that little can be done to evaluate the outcomes of student personnel services until the objectives of such services have been clearly defined. The criteria here presented should aid in defining objectives and in evaluating outcomes.

**A DETERMINATION OF PRINCIPLES AND EXPERIMENTS  
DESIRABLE FOR A COURSE OF GENERAL SCIENCE  
AT THE JUNIOR HIGH SCHOOL LEVEL**

(Publication No. 2466)\*

**Herbert Frederick A. Smith, Ph. D.  
University of Michigan, 1951**

The purpose of this investigation was (1) to determine the relative importance of the principles of science that are desirable for inclusion in a course in general science at the junior high school level; (2) to determine the relative values of certain experiments for inclusion in such a course; and (3) to determine

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\* Microfilm copy of complete manuscript of 212 pages, \$2.65. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-209.

whether each of these experiments should be more appropriately performed as a demonstration or as an individual laboratory experiment.

The principles, deemed by the investigator to be suitable for this purpose, were selected from two research studies and one textbook of general science and then compiled into a composite list. This was submitted to four specialists in the teaching of science for evaluation on the basis of specific criteria. Of the 302 principles, 253 were found to be desirable on the basis of the judges' composite ratings.

The experiments were selected from forty-six recent textbooks and workbooks in general science. Each of the experiments, that the investigator deemed safe and practicable with the facilities likely to be available in the junior high school, was assigned to the "desirable" principle to which it seemed contributory. The problem of each experiment was rewritten in question form in accordance with the inductive method of teaching. The problems were submitted to the aforementioned judges for evaluation on the basis of specific criteria, with the following results:

Of the 248 experiments assigned to the "desirable" principles, each was found to be contributory to its respective principle and to be desirable to an indicated extent. Of these experiments, 29 per cent were found to be more appropriately performed as demonstrations while 71 per cent, in the opinion of at least one evaluator in each case, lend themselves to the individual laboratory method of teaching.

The following conclusions seem justified from the various data:

1. There is an abundance of principles suitable for inclusion in a general science course at the junior high school level.

2. Since 141 of the 253 "desirable" principles were principles of physical science and the remaining 112 were principles of biological science, it seems that offerings from both fields should constitute the general science course.

3. Since all of the 248 experiments were considered to be contributory to their respective principles when taught in accordance with the inductive method, this method is evidently appropriate in a general science course.

4. Since 29 per cent of the experiments were considered to be best performed as demonstrations, the necessity for including demonstrations in general science is emphasized.

5. Because 71 per cent of the experiments were considered at least by one evaluator, to be adaptable to the individual laboratory method of teaching, this method appears worthy of wide use.



6. Simplicity of equipment was one of the criteria on which the experiments were judged, and, since all experiments were found to be desirable, it is apparent that a laboratory course in general science is feasible in a school with even meagre equipment.

7. Due to the lack, at the present time, of suitable experiments, it seems that the laboratory study of atomic energy is relatively inappropriate in junior high school.

## ELECTRICAL ENGINEERING

### ANALYSIS OF FUEL SPRAYS BY ELECTRICAL METHODS

(Publication No. 2399)\*

Ibrahim Hussein Amin Elabd, Sc. D.  
University of Michigan, 1951

Two different methods for the testing and evaluation of fuel spray nozzles, used in the combustion chambers of jet engines, were devised. All previous efforts to devise such testing methods were confined exclusively to the measurement of the size and distribution of the drops in the spray. In contrast, these two methods measure the thickness and the circumferential uniformity of the conical sheath of liquid fuel in the direct vicinity of the nozzle before the liquid disintegrates into drops. In the first method, an electric strain gauge is used to measure the force of impact of the spray sheath upon a cantilevered beam. The sheath thickness is then calculated from the value of the force in the spray. In the second method, the RCA 5734 vacuum tube serves as the pick up to measure the force of the spray, again enabling the sheath thickness to be calculated. In both cases, the pick up can be rotated, and any circumferential variation in the sheath thickness is recorded by an oscillograph.

As a result of the experiments with these two methods, the variations of sheath thickness with fuel pressures were studied for different nozzles. In addition, oscillograph charts were obtained for different nozzles at certain pressures. An examination of these charts quickly reveals any imperfections in the nozzle outlet.

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\* Microfilm copy of complete manuscript of 109 pages, \$1.36. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-143.



The strain gauge set up was found to be better adapted for use at high fuel pressures since it is more durable and compact, but it tends to be somewhat less accurate at the low fuel pressures. On the other hand, the tube device is very sensitive for use at low and medium pressures, but it is too fragile for use at high pressures. It is felt that the rapidity and accuracy of these two methods can be of great service to jet engine development and research.

Other methods for measuring the sheath thickness by utilizing other physical properties of the spray are discussed together with the difficulties encountered in their application to the actual problem. An historic survey of the most successful spray analyzers up to date is included in the Appendix.

#### A STUDY OF THE COUPLING INDUCED BETWEEN TWO MODES IN A MICROWAVE CAVITY BY A GAS DISCHARGE IN A MAGNETIC FIELD

(Publication No. 2425)\*

Robert William Olthuis, Ph. D.  
University of Michigan, 1951

Electro-magneto-ionic coupling is caused by the interaction of an electron gas with high-frequency electric fields in the presence of a magnetic field. The electric forces induce motion of the electrons and their movement in the presence of a magnetic field develops forces normal to their velocity. This causes a deflection from the original line of force and simultaneously produces currents which couple to other electric fields and result in an interchange of power. This phenomenon was studied under controlled conditions both analytically and experimentally. Low power, 1 milliwatt; low gas pressure, less than 2.5 millimeters of mercury; and a frequency of 3,000 megacycles per second were used.

The problem which is treated is the electro-magneto-ionic coupling between two resonant modes in a cavity. This coupling is observed by introducing power into one mode, coupling the power to the other mode by the presence of a low pressure electrical gas discharge in the cavity and a pervading magnetic field, and measuring the power coupled out to a load from the second mode. The coupling is a function of the electron concentration,

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\* Microfilm copy of complete manuscript of 146 pages, \$1.83. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-169.

the magnetic field strength, the load and the geometry. An equivalent circuit and theory are developed for a coupler that give good agreement with the experimental results.

The effect of cyclotron resonance is to enhance greatly the coupling effect. The resonance as a function of magnetic flux density is broadened by increasing the electron concentration. The electron concentration never exceeded that for the Langmuir critical condition for electrons in the experiment, so effects arising from this source are not studied.

The effect of high-frequency electron losses is observed and the magnitude of the loss factor is measured using microwave methods. The losses increase with gas density and electron temperature. An associated microwave measurement also yields the average electron concentration in the tube of gaseous discharge in the cavity.

A tendency toward spontaneous electron cyclotron resonance supported by the d-c electric field of the plasma is observed at the proper magnetic flux density. The effect appears as a small resonance superimposed on the broader resonance curve of power transferred versus magnetic flux density.

Ionic oscillations are noticeable at some times, but their behavior and control are not investigated.

The value of the coupling phenomenon as a means of modulation of microwave power is studied and it is concluded, chiefly because of a low power limitation, that this phenomenon is not commercially valuable for communication.

## FORESTRY AND CONSERVATION

### THE ECOLOGY OF THE POINTE MOUILLÉE MARSH, MICHIGAN, WITH SPECIAL REFERENCE TO THE BIOLOGY OF CAT-TAIL (TYPHA)

(Publication No. 2421)\*

Malcolm Edwin McDonald, Ph. D.  
University of Michigan, 1951

This study was undertaken to determine the cause of a widespread disappearance of emergent aquatic vegetation in Lake Erie and Lake Huron. Intensive observations were made for

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\* Microfilm copy of complete manuscript of 255 pages, \$3.19. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-165.

three years on the Pointe Mouillée State Game Area, Michigan, located on Lake Erie. These observations stressed the following points:

- a. Conditions in area during period of die-off.
- b. Impact of die-off on marsh habitat and changes in the marsh following the die-off.
- c. Physical habitat and make-up of marsh communities.
- d. Activities of vertebrates as members of marsh communities.
- e. Biology and ecology of cat-tail (Typha angustifolia, T. glauca, T. latifolia).

The water level of the marsh is the same as that of Lake Erie. Changes include a long term fluctuation of five feet, an annual fluctuation averaging 1.55 feet, and seiches with amplitudes from one-half inch to several feet. The land is sinking about one foot per century due to a tilting of the basin. This has resulted in abandonment of flooded farmland and extensive wave erosion on the shores.

Between 1910 and 1944 the predominant emergent cover changed from wild rice (Zizania aquatica) to cat-tail (Typha). In 1945 reed-marsh vegetation died abruptly over 1,205 acres. Seven different species (Typha angustifolia, T. glauca, Phragmites communis var. Berlandieri, Scirpus validus var. creber, S. acutus, S. fluviatilis, and Carex stricta) were involved. Sixty-two acres of Cephalanthus occidentalis died about this same time. The die-off occurred during a period of high water.

The reed-marsh was replaced by submerged aquatics. Relict stands of Utricularia vulgaris were replaced by Vallisneria americana, Ceratophyllum demersum, Najas minor, and Potamogeton spp. Sheltered pools and openings were covered by Nymphaea odorata. Wild rice, Zizania aquatica, invaded some of the area.

In 1949 the emergent vegetation had regained 18.5 per cent of the area lost. Mud banks and floating masses of muck were colonized by annual plants, as well as by Sagittaria latifolia, Scirpus spp., and cat-tail. Relict fragments of Typha glauca spread extensively.

The die-off shifted a large area from production of cover and muskrat food to production of waterfowl foods. Solid cat-tail stands were broken up and made more suitable for nesting by coots and gallinules. With the return of emergent vegetation some former cat-tail stands were replaced by Scirpus, useful to waterfowl.

The differences in habitat tolerance and requirements of the species of cat-tail were recorded. The optimum water depth for Typha angustifolia, one to two feet, is six to eighteen inches

deeper than that for T. glauca and T. latifolia, and the maximum depth for successful growth, three feet, is eighteen inches deeper. Growth starts when the mean temperature is about 45° F. (7° C.) and the rate of growth varies directly with the temperature.

On exposed mud banks, stands of Typha glauca and T. latifolia spread an average of seventeen feet a year by vegetative growth, and T. angustifolia spreads similarly but more slowly. When growing in its usual station in the water, T. angustifolia forms tussocks by upward growth of short rhizomes. Lack of oxygen in the submerged mud probably contributes to this reduction in growth. The formation of tussocks results in open, pool-dotted stands of T. angustifolia in contrast to closed, solid stands of T. glauca.

The die-off of emergent vegetation is believed to be due to an unusually high winter water level, which submerged the dormant shoots and killed the plants. High summer levels may have been responsible for part of the damage. Insects were not involved, and no evidence was found linking any microorganisms with the die-off.

## GEOGRAPHY

### PROBLEMS OF RESETTLEMENT ON SAIPAN, TINIAN AND ROTA, MARIANA ISLANDS

(Publication No. 2383)\*

Neal Monroe Bowers, Ph. D.  
University of Michigan, 1951

This study is concerned with the evaluation of resources on Saipan, Tinian, and Rota, the potentialities for commercial development, and the possibility of resettling the native inhabitants on a basis which will support the prewar standard of living. During World War II, the Japanese Mandated Marianas were attacked by American forces in the island-to-island fighting across the Pacific toward Japan. All towns and villages were destroyed, the population displaced, and the economy reduced to a subsistence level. The civilian populace was brought together in camps, and immediate needs for food, clothing, and shelter met by Military Government. Repatriation of the Japanese removed seven-eighths

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\* Microfilm copy of complete manuscript of 492 pages, \$6.15. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-127.



of the population, and the natives were left to reconstruct their former manner of life in a war-torn environment. A responsibility rests with the United States, now in control of the area under trusteeship from the United Nations, to aid the natives in developing their resources and securing the highest possible degree of economic independence.

The islands are microscopic in size and meager in resources. They are of strategic importance to the United States but fill no particular economic need. The prewar standard of living was the product of Japanese energies rather than native efforts. At present, the population is too small to utilize the area to the extent needed to restore the former standards, and too inexperienced to forge ahead in commercial activity without aid and direction.

Agriculture and fishing offer the best possibilities for development. The Marianas possess no outstanding advantages over other tropical areas, and are handicapped by a number of disadvantages. These include distance from market, limited areal extent, small effective population, the non-commercial attitude of the people, high costs of production, and the need to initiate production, establish transportation, and secure markets. Efficiency of production must be achieved if Mariana products are to compete on world markets without tariff protection. It is recommended that Congress grant the government-operated Island Trading Company powers to supply capital and leadership for the introduction of cash crops, the development of fishing, the maintenance of dependable transportation, and the opening of Far Eastern markets.

Solution of the many problems associated with resettlement will require a long period of time. The land produced abundantly under the Japanese and can be made to do so again, but the people must be educated to the potentialities of the area, and increase in numbers to restore the former productivity. Even with full development of the area, it is most improbable that the prewar standards, if reestablished, can be maintained without continuous subsidy. The Marianas have not been self-supporting throughout the greater part of their history under foreign rule. Trusteeship of the islands is an economic liability to the United States. The aid necessary to restore and maintain accepted standards of living and public welfare must be considered in terms of the strategic benefits received.



**PUBLIC LAND POLICY AND PROGRAM  
IN SOUTHERN MICHIGAN**

(Publication No. 2428)\*

John Hitchcock McMurry, Ph. D.  
University of Michigan, 1951

The purpose of this work is to appraise the various policies and programs that have been developed in southern Michigan to provide the public with state-owned recreational lands. It is also our purpose to analyze these developments in terms of future trends and potential developments.

Certain tools of the geographer are at hand for this work: Land classification and soil maps, aerial photographs, census data, land ownership and topographic maps, various land use and other technical reports, and personal field reconnaissance, when applied to these problems lead to fairly reliable long-range conclusions.

Results of our study show that of the 2,500,000 acres of land in southeastern Michigan which appear to be potentially available to public ownership, less than 20 per cent is open to acquisition based on principles followed to date.

The conclusions are that there will be gradually decreasing public acquisition for a decade or more, followed by more or less complete stoppage of the program; concentration of activities on areas already in state ownership, and no probability of a public land program comparable to that of northern Michigan.

**THE PATTERN OF ORCHARDS IN MICHIGAN  
AN HISTORICAL-GEOGRAPHIC STUDY OF THE  
DEVELOPMENT OF A PATTERN OF LAND USE**

(Publication No. 2442)\*\*

Clarence Walter Olmstead, Ph. D.  
University of Michigan, 1951

The objectives of this study are to determine the pattern of orchards in Michigan, to understand how it developed, and to

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\* Microfilm copy of complete manuscript of 102 pages, \$1.29. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-172.

\*\* Microfilm copy of complete manuscript of 565 pages, \$7.07. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-186.

examine its relative stability and significance. The term "pattern" refers primarily to the areal distribution of orchards, secondarily to the materials and methods of orchard land use.

Western Michigan ranks as one of the world's important regions in the production of mixed deciduous fruits. Most orchards are located near Lake Michigan in an irregular, nucleated pattern. Major nuclei are centered in southwestern Michigan, Oceana and Mason Counties, around Grand Traverse Bay, northwest of Grand Rapids, and in southeastern Michigan northwest of Detroit.

During the first half century of settlement (1825-1875) orchards were dispersed throughout settled Michigan. Localization began at St. Joseph about 1850 with recognition of the lake-shipment relationship to the new Chicago market. During 1850-70 there was demonstrated the moderation by Lake Michigan of low winter temperatures along its eastern shore. Recognition of this phenomenon, and of the favorable relationship to Chicago and Milwaukee markets, stimulated expansion of orchard specialization in the littoral area.

Early expansion largely ignored evaluation of land. Slowly-demonstrated inadequacy of the outwash and lacustrine plains led to localization of orchards in the moraines. Increasingly careful evaluation during recent decades is leading to further localization on those morainic land types possessing gentle slopes and moderately fertile soils.

Michigan orchard regions are subject to the hazards of low winter temperature, spring frost, and weather unfavorable for pollination. Low winter temperatures are distinctly moderated along the eastern side of Lake Michigan. The spring frost hazard is markedly reduced near the shores of the Great Lakes. Evidence does not indicate superiority of Western Michigan over other littoral areas. Western Michigan does profit from the moderation of winter temperatures and from the existence of land types possessing adequate air drainage, both within the littoral area having reduced spring frost hazard.

Increasing technology has greatly encouraged the specialization and localization of fruit growing. For example, the investment in knowledge and equipment necessary for the control of orchard diseases and pests, alone, has tended to eliminate small commercial orchards. Specialization in knowledge, equipment and services begets localization in area.

Most important trends in the Michigan orchard industry are increasing specialization, increasing localization and refinement of the pattern of orchards in response to continued evaluation of climate and land type, growth of the cherry industry, decline in number of apple trees, but at a rate slower than in other apple regions, increasing mechanization and technology, increase in

size of individual orchard enterprise, increase in production per tree, and increasing quality and standardization of product.

The pattern of orchards in Michigan does not, as often stated, result from delay of spring warming near Lake Michigan until danger of frost is past. It is, instead, the result of changing evaluation of land, climate and marketing opportunities, during more than a century, by a people possessing rapidly changing cultural values and technology.

## GEOLOGY

### GEOLOGY OF THE CASSVILLE QUADRANGLE, BARRY COUNTY, MISSOURI

(Publication No. 2335)\*

Edward Lee Clark, Ph.D.  
University of Missouri, 1941

The Cassville Quadrangle is situated in southwest Missouri. The southern edge of the quadrangle is essentially the state boundary between Missouri and Arkansas. Physiographically, the quadrangle is on the border of the rugged Ozark region, with the Springfield Plateau separated from the Salem Platform by the Eureka Springs Escarpment.

The rocks are of sedimentary origin and consist of limestone, dolomite, sandstone, shale, chert, and conglomerate. They range in age from Canadian of the Ordovician period to the Pennsylvanian period; the Silurian System is apparently not present in the area. Eleven formations are recognized, ten of which have previously been known to occur in the southwest part of the Ozark region. The Fortune is herein described and mapped for the first time, and is known at present in the Cassville and Shell Knob quadrangles. The St. Joe "member" of the Boone formation of Arkansas is divided into three members, the Compton, Northview, and Pierson, and correlated with these recognized units of the Springfield area. Major unconformities are at the tops of the Canadian, the Fortune, the Reeds Spring, the Keokuk, and the Fayetteville.

In the preparation of the areal geologic map, the Fortune, Sylamore, Chattanooga, and St. Joe formations were mapped as

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\* Microfilm copy of complete manuscript of 244 pages, \$3.05. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-79.

a unit because of the narrowness of the belt of outcrop of these formations in the rugged region of the Eureka Springs Escarpment. The Chester formations, consisting of the Hindsville, Batesville, and Fayetteville, are mapped as separate units. The Hindsville is recognized as a mapable unit and is elevated to formational rank. The Hale sandstone formation is recognized and mapped for the first time in Missouri.

The major structural features of the quadrangle consist of two major faults and a synclinal basin. The faults strike north-east-southwest and are designated as the Eagle Rock and Greasy Creek faults. The synclinal basin is to the east of the Greasy Creek fault and has preserved within it the Chester formations and the Hale formation.

The Jefferson City dolomite, St. Joe limestone, Keokuk limestone, and the Hindsville limestone have been used for building stones, crushed stone aggregate, and agricultural limestone. The Keokuk limestone northwest of Cassville has been used for dimensional stone. Stream gravels in White River, Roaring River and Flat Creek have been used for concrete aggregate and road metal. Metallic mineral resources in commercial quantities are not known.

#### PLEISTOCENE AND RECENT SEDIMENTS IN WESTERN LAKE ERIE

(Publication No. 2453)\*

Alex R. Ross, Ph. D.  
University of Michigan, 1951

Seventy-one borings were made through Pleistocene and Recent sediment to bedrock in the Bass Islands vicinity, Lake Erie. One complete core, 94 feet in length, was obtained. Bottom samples were taken at each boring location.

Varved clay was deposited in the Bass Islands vicinity from the beginning of the third stage of Lake Maumee until after the beginning of the first Lake Algonquin. Data from a varve count and from mechanical analyses of a complete section of the varved clay, 77 feet in length, are the bases for a tentative chronology in years of the glacial lakes in the Erie basin.

Present lake bottom topography reveals nothing of the underlying bedrock topography. Theories of origin of the Erie

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\* Microfilm copy of complete manuscript of 68 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-196.



basin based on present bottom configuration are, therefore, in error. A probable pre-glacial drainage system is proposed and it is believed that the bedrock topography in the Bass Islands vicinity is the result of normal stream erosion.

During the Kirkfield stage of Lake Algonquin a low water stage existed in Lake Erie. During this low water stage, areas not protected against wave action were eroded and the sediment is thinner in these places than in the protected areas. Data from mechanical analyses of the bottom sediment suggest that the particle size of sediment deposited at the present time is controlled largely by current and wave action.

## HISTORY

### COUNTER-CRUSADE: A STUDY OF TWELFTH CENTURY JIHĀD IN SYRIA AND PALESTINE

(Publication No. 2380)\*

Margaret Elizabeth Bertsch, Ph. D.  
University of Michigan, 1951

This study is an attempt to discover whether the Muslims of the twelfth century in Syria and Palestine responded to the crusades by invoking holy war, jihād, in a spirit of genuine religious zeal.

The sources utilized include four historians: Ibn al-Qalānisi, Ibn Shaddād, Ibn al-Athīr, and Abū Shāma; and two non-historians: Usāma ibn Munqidh and Ibn Jubayr. All of these men except Abū Shāma are primary sources for the period.

The method employed was to determine the general aims, methods, and types of subject matter included in Islamic historiography, and then to analyze the relation of these authors to the general pattern, as well as their individual ideals and aims. The sources were then used to investigate whether, in view of the canonical definitions and requirements, jihād was fought in this period, and what the Muslims thought of these wars, their own leaders, and their opponents.

The resulting information shows that these writers all subscribed to one of the two main purposes of Islamic historical writing. Either they saw in history Allāh's divine plans being

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\* Microfilm copy of complete manuscript of 391 pages, \$4.89. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-124.



worked out, or on a more immediate scale they found practical military and political lessons in history. In either case they endorsed the methods and disciplines of historical writing evolved by their predecessors.

These men expected to find evidence of Allāh at work in their own day, and did, although they show that before Nuradin and Saladin there was little Muslim cooperation against the Christians. The significant fact is that Saladin and his predecessors in jihād were judged mainly according to religious standards. Saladin was great not because of political or military success, but because of his obedience to Allāh. His reputation rested on that, and tremendous enthusiasm was built up for this servant of Allāh who defeated Allāh's enemies so consistently. It was defensive war, however; there was no thought of forcing the enemy to convert or submit. To push these enemies of Allāh out of the homeland of Allāh's people was the only aim. Further, the Muslims all looked on the Christians with disdain. Acutely conscious of their own superiority as Muslims, they show nothing but sporadic curiosity concerning the peculiar infidel ways, if even that attitude appears.

The conclusions are that jihād, enthusiastic and zealous, was fought in the twelfth century. The Muslims of Syria and Palestine only gradually built up to effective jihād as they were forced into political unity. It was only defensive jihād in that there seems to have been no real thought of forcing the infidel to submit or convert as truly canonical jihād would involve. In terms of what the men of the time thought of what they were doing, of their leaders and their opponents, it was holy war fought for Allāh and guided by Allāh, waged against men who were not only invaders, but enemies of Allāh himself. Men reared in a culture based on religion could hardly interpret the wars needed to defend that culture in any other way.

## HISPANIDAD IN SOUTH AMERICA, 1936-1945

(Publication No. 2321)\*

William Baker Bristol, Ph.D.  
University of Pennsylvania, 1947

The purpose of this dissertation is to describe the South American program and activities of Spain's Franco regime from 1936 to 1945, and to portray the reception of that program — its successes and its failures — in the South American republics.

Even before 1936, there had existed in Spain for many years a movement, known as hispanoamericanismo, that aimed to draw the Hispanic American countries closer to Spain. Some progress toward certain of the goals of this movement was realized in South America prior to 1936. In particular, a good deal of sentimental affection for the mother country developed in the Spanish-speaking nations.

The Hispanidad movement promoted by Franco regime involved two main ideas: that of restoring, preserving, and strengthening the Hispanic tradition throughout the Hispanic world, and that of rapprochement between Spain and Latin America. Restoring the Hispanic tradition meant to the Franquistas reviving the strongly Catholic spirit of the Spanish Empire of the sixteenth and seventeenth centuries and getting rid of the liberal, democratic, and Communist ideas that had come into the Hispanic world since about 1700. The Franquistas also desired that, preferably on the basis of an Hispanic ideology in harmony with their own, the nations of Hispanic America should draw closer to contemporary Spain in the political, cultural, and economic spheres and, if possible, form a bloc of states under her leadership. To promote these aims, the Franco regime set up organizations in Spain (particularly the Council of Hispanidad) and sent propaganda to South America by means of radio, books, visitors, and diplomatic agents. Furthermore, the Falange and other organizations among the Spanish residents of South America carried on propaganda for the Franco regime.

Although many South Americans had a rather vague, sentimental affection for Spain (considered apart from the existing political regime), the bulk of the people apparently gave little serious thought to the question of Hispanism and knew or cared little about the Franquista concept of Hispanidad. Real interest

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\* Microfilm copy of complete manuscript of 641 pages, \$8.02. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-67.

in promoting the latter idea was confined mainly to intellectual and journalistic circles. Those South Americans who actively championed concepts of Hispanidad that were to an important degree in harmony with the Franquista concept, were generally zealous Catholics (lay or clerical), who often practically identified Hispanidad with Catholicism.

Hispanidad involving the idea of restoring a strongly Catholic spirit and reacting against liberalism and modern concepts of democracy found warm and active supporters among certain Argentine nationalists and in a group of young Colombian Conservatives connected with Laureano Gómez. A similar concept of Hispanidad was championed by a few other small groups and scattered individuals in South America. A somewhat different concept of Hispanidad was promoted by certain intellectuals in Lima, who, although often anti-liberal, did not usually stress the idea that Hispanidad meant a reaction to liberalism, but rather used Hispanist arguments for the purpose of refuting those who exalted the Indian tradition of Peru and deprecated the Spanish.

South American proponents of the types of Hispanidad just mentioned generally favored cordial and friendly relations with Franquista Spain but did not, on the whole, put much stress on creating very concrete, far-reaching political ties with her. Although some other South Americans also remained friendly to Franquista Spain throughout World War II, in general the relations of the Spanish government with South America deteriorated during the war, owing mainly to the fact that the Franco regime was a largely fascist state and was regarded as closely tied up with the Axis powers, with whom all the American nations were formally at war by the spring of 1945. Moreover, commercial and cultural relations between Spain and South America were seriously hampered by complications resulting from the Spanish civil war and the subsequent world conflict.

THE EMERGENCE OF THE NATIONALIZATION  
ISSUE IN THE COAL-MINING INDUSTRY  
OF GREAT BRITAIN, 1893-1919

(Publication No. 2486)\*

Hoh-Cheung Mui, Ph. D.  
Columbia University, 1950

Nationalization is the final state of a process of increasing state intervention in an industry. An effort to understand the meaning of nationalization, therefore, begins with an analysis of the interplay of the economic, social, and political conditions under which state intervention was instituted at different times. Part I of this essay distinguishes the various phases and indicates the relationship of each to the process of nationalization.

State intervention in the British coal industry can be divided into two types: that which regulates technological operations and that which regulates conditions of employment and the economic organization of the industry. Both were instituted to remove specific defects apparent at the time. Up to the decade of the 1880's, state intervention was largely of the first type. In that decade, state intervention of the second type was expressed in the demand for an eight-hour day. This was enacted in 1908, and four years later the state was virtually compelled to enact a minimum wage law. Between the 1880's and 1912, changes took place which on the one hand made the coal industry more important in the British economy and on the other hand made it more vulnerable to international competition. At the same time, the outlook of the British miners toward the ownership and operation of the industry as well as toward their own position in British society was altered. Parts II and III of this essay establish a relationship between the economic and social changes and the growing conviction, at least among the miners, that nationalization was the only solution to the difficulties besetting the industry.

The necessity to mobilize vast amounts of material and human resources during World War I heightened the prewar technological and economic difficulties. In 1917, the piecemeal war-emergency regulations were no longer able to cope with the maladjustments. An overall control was instituted. This war-time experience demonstrated the practicability of nationalization

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\* Microfilm copy of complete manuscript of 407 pages, \$5.09. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-229.

to the miners as well as to many qualified students of the industry. In 1919 the post-war agitation for the immediate nationalization of the coal industry resulted in the appointment of a royal commission with a wide term of reference and power to inquire into the problem. Parts IV, V, and VI of this essay describe the wartime experience and the miners' action to persuade the state.

Throughout the period from the 1890's to 1919, the coal owners of Britain were the main opponents of almost all measures of state intervention. Up to 1919 the owners fought a steadily losing battle. In that year, they persuaded the government to reject nationalization. The rejection may be explained by the absence of a competent personnel and machinery with which the state could operate the industry and also by the absence of a general social outlook favorable to an experiment of this kind. Part VII of this essay clarifies the confusing post-war political and social conditions, the owners' action to rally the support of other industrial and commercial interests, and the manner in which pressure was put on the government.

Although this essay, ending with the failure of the demand for nationalization in 1919, does not deal with its final achievement, attention is focused on the essential conditions under which the demand emerged as a central issue. Even before the rise of the Labour Party, which enacted nationalization in 1945, the coal industry had been beset by increasing economic difficulties, the removal of which was made a function of the state. At the same time the change of social outlook, which originated from the tremendous strides made in the nineteenth century toward the improvement of general material well-being, made nationalization more palatable. In view of these considerations, it may perhaps be suggested that nationalization was made possible by the many generations which had exploited and consumed this natural resource prior to 1945. As early as 1866 William S. Jevons had called attention to the eventuality in which "we shall have influences acting against us which are now acting strongly with us."



THE CONSORTIUM REORGANIZATION LOAN TO CHINA  
1911-1914; AN EPISODE IN PRE-WAR DIPLOMACY  
AND INTERNATIONAL FINANCE

(Publication No. 2446)\*

Shu Pu, Ph. D.  
University of Michigan, 1951

About the consortium reorganization loan much has been said, but little research has ever been done. This study, based largely on Western diplomatic documentary sources and on a sufficient amount of Chinese sources, is the result of such an attempt. The detailed account of the six power consortium, together with a survey of its background, and of the tedious but significant loan negotiations not only lays bare the true character of the so-called "international economic cooperation" prior to 1914, but also adds to the understanding of the diplomacy of imperialism. Chinese internal politics was delicately involved, and the famous "second revolution" has been, for the first time, carefully examined.

During the Chinese revolution of 1911, the policy of the foreign countries, the self-styled "powers," was twofold, namely, "neutrality" and "concerted action." As finance, which happened to be the most difficult question for both sides, was a decisive factor in the situation, no loan of considerable amount was made to China. When it was clear that the Manchus had to go and that in order to protect foreign interests a large foreign loan, which had been contemplated for some time, might well strengthen the hands of Yuan Shih-Kai, the "strong man," the powers took steps to cooperate in making the loan. Accordingly, upon the abdication of the Manchus on February 12, 1912, while in Peking negotiations were started for the reorganization loan, in Europe negotiations were started between the four consortium powers, Britain, France, Germany and the United States on one part and Russia and Japan on the other, for the formation of the six power consortium. The loan negotiations were very lengthy and difficult. Only part of the total amount, L 60 million, of the projected loan, to be issued in instalments over five years, was issued in the spring of 1913. Thereupon, the consortium powers obtained financial control of China through their "advisers" to the Chinese government, but failed in making good their claim that the

\* Microfilm copy of complete manuscript of 693 pages, \$8.67. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-190.

consortium should be China's sole financial agency for a period of five years. Peking had no other remedy for its chronic financial straits, but resisted foreign demands vigorously.

Nor were the negotiations for the formation of the six power consortium smooth and easy. For better or worse, an agreement was finally signed among the powers concerned on June 18-20, 1912. This was where the real trouble began. Russia and Japan insisted that nothing contrary to their "interests" should be done, and their interests, Russia frankly declared time and again, lay in keeping the potentially powerful neighbor, China, weak and poor. Consequently, the so-called "Quadruple Entente Powers" — Britain, France, Russia and Japan, secretly established themselves as a group inside the six power consortium to dominate its policy against the wishes of Germany and the U. S. The latter withdrew from the consortium before the signature of the loan. This the U. S. could easily do because her investments in China at that time were comparatively small; this Germany could not do because hers were comparatively great.

Chinese nationalism, awakened in modern times, varies in expression and in strength according to time and social changes. The tragedy of Yuan Shih-Kai was that he could neither defeat his domestic foes with his own strength nor defy foreign powers successfully. Defeated in the "second revolution," the Kuomintang members under the leadership of Sun Yat-Sen were bitter, and began to wonder why the Western countries, from which they had learnt the "sacred" principle of constitutional government, had backed Yuan Shih-Kai whose measures were "unconstitutional," and whose government was "undemocratic." Ten years later (1924), it may be noted here, they thought they had found the answer, and invited the bolsheviks to China.

#### THE DUC DE MORNAY AND FRANCO-RUSSIAN RELATIONS, 1856-63

(Publication No. 2475)\*

Roger Lawrence Williams, Ph. D.  
University of Michigan, 1951

This is a study of the role of the Duc de Mornay in Franco-Russian relations from 1856 to 1863. It has not merely been an attempt to trace the involved diplomacy of these seven years,

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\* Microfilm copy of complete manuscript of 133 pages, \$1.66. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-218.

which began with the end of the Crimean War and continued until the Polish Rebellion of 1863. The primary problem has been the political philosophy and motives of the Duc de Morny as reflected in his great desire for a Franco-Russian alliance. Secondly, it is hoped that a study of the relationship of the Duc de Morny to his half-brother, Louis-Napoleon Bonaparte, will cast additional light on the rather mysterious philosophy and foreign policy of the latter.

The study has been made with the use of published sources. A group of Morny papers was published at the end of the last century. Much valuable material was destroyed at Morny's order when he was dying, while a third group of papers is held by the Morny family in France and was not available for this study.

The results indicate that the traditional opinions of Morny need revising. While there is no doubt that Morny was a sartorial, social, and financial leader of his time, he also felt a genuine loyalty to the dynasty. Secondly, Morny seems to have had less influence on Napoleon III than is generally believed, and the collapse of the Second Empire was neither attributable to his lack of influence during his life nor to his death in 1865.

The general conclusion is that Morny's primary interest was to secure the future of the Bonaparte dynasty. The firm establishment of the dynasty would have done more than just insure the succession of the Prince Imperial or guarantee Morny high position. If Morny could have been the determining factor in establishing the Bonapartes, the natural gratitude of the dynasty might have removed the stain of Morny's birth and legitimized him even in the eyes of Louis-Napoleon. In order to establish the dynasty, Morny championed an alliance with Russia, a project which failed by 1863, when France and Russia were sharply divided by Polish national aspirations.

## JOURNALISM

### THE NEW YORK NEWS, 1855-1906: SPOKESMAN FOR THE UNDERPRIVILEGED

(Publication No. 1871)\*

David F. Long, Ph. D.  
Columbia University, 1950

The New York News (also known at varying times as the New York Daily News and the New York Evening News) was founded in 1855 to represent the states rights pro-Southern faction of the Democratic Party. It became the leading New York apologist for the Confederate States during the Civil War. Under the control of Benjamin Wood, brother of Mayor of New York City, Fernando Wood, the News became so pronounced an enemy of the Lincoln Administration and the Union war aims that Federal mailing privileges were denied and publication was halted from September, 1861 to May, 1863. Upon its reissue the paper was more seditious than before as Congressman Benjamin Wood made the News the official organ of the Order of American Knights, a secret society of ardent Peace Democrats. Wood barely escaped trial for treason before the military court judging the Lincoln assassins after he had cashed a check drawn on Jacob Thompson, director of Confederate espionage operating from Canada. Unchastened by this narrow escape, Wood caused another sensation by employing such regenerate Confederates as Roger A. Pryor and John Mitchel as editors of his newspaper. So complete was the identification of the News with the Southern cause that its development was seriously restricted and by 1867 its financial condition was desperate.

Benjamin Wood found a solution to his monetary problem by alterations which advanced the News to national circulation leadership and earned a fortune for its proprietor. Wood changed from a morning to an evening edition and reduced his price to one cent. The overwhelming political emphasis in news and editorials which characterized the paper from 1855-1867 was dropped and a pro-Irish, pro-Catholic, and pro-Tammany slant was carefully aimed at the Irish masses in New York City. The results were spectacular. The paper's circulation soared as its columns featured crimes of passion, disasters, and financial speculations, in addition to cheap advertisements attracted by the special audience of the laborer and his family to which the News appealed.

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\* Microfilm copy of complete manuscript of 260 pages, \$3.25. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-62.



In serious personal financial difficulty by 1879 (probably the result of heavy gambling losses) Benjamin Wood sold 43% of the News Publishing Company stock to Colonel William L. Brown, Civil War veteran, miner, and Ohio newspaper publisher. Brown became business manager, Wood dictated editorial policy, and George Bartholomew efficiently directed operations as managing editor. During the decade from 1880-1890 the Wood, Brown, Bartholomew triumvirate guided the News to the apex of American press circulation. While the News continued to prosper during the next ten years, its circulation dropped to third behind the new "yellow" newspapers, the New York World and the New York Journal.

As late as 1900 the News sold over 200,000 copies a day and was still hailed by the trade papers of journalism as indispensable to the Irish of the city but within a few weeks both Wood and Bartholomew died and the control of the paper passed to Wood's widow, Ida E. Wood. Although almost sixty with little education or newspaper experience, Mrs. Wood made the unfortunate decision to publish the News herself. Possessing majority stock control she was able to force out Colonel Brown and immediately launching a program of rigid financial retrenchment, discharged employees almost en masse and printed a great metropolitan daily newspaper by clipping items from the morning papers and running them without credit in her evening issue. While she cleared a profit in 1900, ensuing losses in circulation and advertising as well as the threat of law suits caused her to sell the property to Frank A. Munsey in November, 1901. Mrs. Wood lived as an extreme recluse for the next thirty years and left a fortune close to a million dollars on her death in 1932.

Frank A. Munsey, chief amalgamator and executioner in American journalism, owned the News for almost three years. His tenure was marked by erratic deviations which succeeded in ruining what circulation and advertising remained. Having lost between \$500,000 and \$750,000 in this venture, Munsey sold the News for a pittance to an employee, Thomas C. Quinn in 1904. Quinn reverted editorial policy to its former pro-Irish stand, succeeded in increasing both circulation and advertising, but became involved in a Tammany dispute and lost \$40,000 worth of City advertising. The loss was fatal; Quinn was forced to cease publication in December, 1906.\*

The New York News was ruined by a combination of what was basically chance in addition to the operation of vast economic

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\* The modern tabloid, The Daily News of New York, has no connection whatever with the newspaper whose biography has been under discussion.



forces. The first was represented by the peculiar personalities and unusual events which afflicted the paper from 1900 to 1906; the second concerned the centralization occurring in journalism as well as in other American industries at the turn of the century. The News has been forgotten, largely because it circulated in the slums and its readers belonged to the underprivileged classes which leave little or no record of opinion. Also the newspaper is dead; it does not have the semi-existence enjoyed by journals whose names have survived in combination with others. But the New York News was a circulation giant and an originator of many journalistic techniques. It merits an honored place in the history of American newspapers.

#### CONCENTRATION OF OWNERSHIP AND CONTROL IN THE AMERICAN DAILY NEWSPAPER INDUSTRY

(Publication No. 2352)\*

Royal Henderson Ray, Ph. D.  
Columbia University, 1950

Daily English language newspapers of general circulation in the United States decreased from 2202 units in 1909 to 1748 units during 1948. Investigation of the economic causes and consequences of this decrease in units and the increased concentration of ownership and control in the industry constitutes the basis for this study. The study falls into three parts: First, basic statistical trends; second, field case studies; and third, analysis and interpretation. The third part is both statistical and economic in character.

During the 40 year period covered by this study 1957 dailies suspended publication or changed from daily to weekly, semi-weekly or tri-weekly publications, while during the same period 2060 new dailies were established. Decrease in units and concentration of control is attributed primarily to horizontal integration, embracing mergers, consolidations, local combinations and group ownership; integration of newspapers with broadcasting stations, including AM, FM and TV facilities; and to some extent, vertical integration, particularly "backward" integration of newspapers with newsprint mills.

Mergers or consolidations where two newspapers were amalgamated and continued as one unit occurred in 547 known

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\* Microfilm copy of complete manuscript of 482 pages, \$6.03. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-96.

instances. In approximately 300 communities local combinations occurred where two or more newspapers in the same or adjacent cities were enjoined in some form of sales, publishing or ownership alliance. Another significant concentration trend was the growth of group ownership. Group or chain combination, ordinarily defined as two or more units in different cities under the same ownership or control, was in 1948 in its eighth decade of development in the United States. During 1910 there were 13 known group ownerships which controlled 62 units. By 1949 such ownerships increased to 70 groups with units controlled numbering 386.

Integration of newspapers with radio and television facilities constitutes another significant development during the second quarter of the twentieth century. During early 1949, 785 of the broadcasting stations (AM, FM, and TV) on the air were affiliated with newspapers. Integration appears to be motivated in part as an insurance measure. Many newspaper publishers believe that increase in revenue of broadcasting stations is at the expense of newspapers.

Concentration of ownership of daily newspapers has been of such significance that competition of daily newspapers has ceased except in larger cities. Newspaper monopoly cities increased from 42.9 per cent of all daily newspaper cities in 1910 to 91.6 per cent during 1945. Broad behavior patterns, commonly associated with conditions of monopolistic competition, are discernable.

These broad behavior patterns include stabilization of prices, reflected in the tendency for advertising and subscription rates to remain rigid over time; price discrimination, exemplified by charging different groups of advertisers and subscribers different rates for advertising space and subscriptions at the same time; and non-price competition, evidenced by efforts to increase sales of advertising space and subscriptions by using incentives other than cutting prices. These behavior patterns appear characteristic of newspapers both in one newspaper towns and in cities having two or more daily newspapers.

Forces contributing to monopolistic trends in the industry are national, sectional and local in scope. General causes appear to include technological change, efforts of publishers to form units of more efficient size, and tardy enforcement of anti-trust laws. Legislation enacted during a period of professed allegiance to laissez-faire apparently intended enforcement of competition. Concentration trends, however, indicate that existing laws either are inadequate or were not enforced. For example, restrictions in membership by-laws of the Associated Press before 1945 appear to have limited competition of newspapers and to have contributed to local mergers and consolidations.

SOME ASPECTS OF BOOK PUBLISHING IN  
NEW YORK CITY, 1865-1914

(Publication No. 2356)\*

Donald Henry Sheehan, Ph. D.  
Columbia University, 1950

Book publishers considered their business to be a particularly unprofitable one, but felt that the loss in monetary rewards was offset by the satisfactions derived from their association with literature. The origins of modern publishing methods and of the companies prominent in the "Gilded Age" can be found in the pre-Civil War period. Retail booksellers and printers began in the 1820's to engage in publishing activities. They established dignified patterns of publishing which their firms maintained with surprisingly little change after the Civil War.

The relative importance of books in the total economy declined during the "Gilded Age." The industry made adjustments to the new industrial era, but did not respond to the trend towards monopoly. Multiplicity of titles caused relatively high costs, and made difficult the problems of distribution. The increasing importance of magazines affiliated with book publishers temporarily threatened to penalize publishers who didn't leave them; but at the turn of the century, popular magazines owned by independent interests usurped the field. An attempt to establish a textbook monopoly was unsuccessful.

In an effort to bolster a continuity of relation between individual authors and publishers, the latter established a principle of "trade courtesy" which limited competition for manuscripts. "Trade courtesy" was also applied to uncopyrighted British works in an attempt to regulate the industry in the absence of an international copyright. By 1900, relations with authors became unstable; authors frequently shifted publishers, agents made the business more "commercial," and "trade courtesy" declined.

Contracts with authors for manuscripts gradually became more uniform. The outright purchase of manuscripts slowly gave way to a system of royalty payments. The standard payment of 10% of the retail price was increased after 1890. Authors' agents and the passage of the international copyright law in 1891 are among the factors responsible for the better position of authors.

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\* Microfilm copy of complete manuscript of 289 pages, \$3.61. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-100.

Although the prominent houses were run by men of conservative views, the interest in sales induced them to publish many books written from unorthodox viewpoints. The censorship was stronger in the fields of religion and morals than economics and government. Many books considered "radical" were brought out by conservative houses.

Editing became increasingly important. Many books, especially those in series, resulted from the publishers' initiative rather than that of the authors. A system of "readers" was introduced. Editing was done at every stage in the creation of a manuscript, but was most comprehensive in the beginning stages.

At the close of the Civil War, very little commercial travelling was undertaken. "Trade sales" held twice a year in New York presented out-of-town buyers and wholesale "jobbers" with an opportunity to buy new books at auction. The "trade sales" gradually declined, and commercial travelling became more extensive. Branch offices were established.

Advertising became important about 1900 but was expensive and of questionable value. The local bookstores were inadequate and were supplemented by sales through the mail. However, publishers continued to consider bookstores their principal means of distribution.

In attempting to solve the problems of irregular discounts and under-selling, the trade publishers organized a series of associations. These were generally unsuccessful until the American Publishers' Association established in 1901 a system of maintaining prices which endured even after the collective effort was judged by the United States Supreme Court to be illegal.

At the close of the era, it was generally agreed that the reforms instituted had not brought prosperity, and that the business would not be profitable unless better means of distributing books could be found. The trade had done little to attempt to reduce the number of different titles, although this reform seemed to offer the best chance of success. In general, publishers showed more interest and more ability in the editorial aspects of the business than in merchandizing.



## LANGUAGE

### THE ORTHOGRAPHY AND PHONOLOGY OF THE LATIN PAPYRI

(Publication No. 2386)\*

Arthur Ferdinand Carlson, Ph. D.  
University of Michigan, 1950

This is a study of the language of the Latin papyri, wax tablets, and ostraca from the first three centuries of the Christian era. The great majority of these documents come from Egypt, but a number of unpublished papyri from Dura-Europos in Syria are included. A total of 193 documents was examined, of which 108 yielded variant spellings.

The study has two aims: first, to provide a check-list of orthographic deviations from Classical Latin; second, by a linguistic classification of these variant spellings to correlate the language reflected in the papyri with Vulgar Latin from other sources and with the Romance languages.

In general, the wide dissemination of the standard orthography of the grammarians is indicated by the fact that forty-four percent of the documents examined showed no deviations and many others only one or two deviations from the classical norm. This conclusion is subject to the reservation, however, that a number of papyri are so fragmentary or contain so many lacunae that the text can only be inferred. In such cases, lack of deviations is no proof of conformity to classical standards.

The most commonly attested deviations from classical orthography in the papyri are:

1. Loss of final m.
2. Loss of initial h.
3. Loss of n before stops and s.
4. Contraction of ii to i.
5. Syncope of vowels in unaccented syllables.
6. Simplification of double consonants.
7. Gemination of single consonants before i in hiatus.
8. Substitution of e for ae, and vice versa.
9. Substitution of e for i.
10. Substitution of o for u.
11. Substitution of b for v.
12. Substitution of q for c before u.

\* Microfilm copy of complete manuscript of 149 pages, \$1.86. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-130.



The papyri also provide examples of some less common phenomena, such as EXIVT for exivit (syncope with samprasana), FLAVS for Flavius (double syncope), ITIBVS for Idibus (confusion between voiced and voiceless stops in medial position), and ECCVTES for equites (fusion). The date of a few other developments can be set farther back from the evidence of the papyri, e. g., DONACIANI for Donatiani (130 A. D.), CON for cum (early II century), the remodeled feminine dative ILLEI which produced Romance lei (early II century).

Finally, it is worth noting that the language of the papyri has a great many features in common with that of the Pompeian graffiti. The presence of a large Greek-speaking element at Pompeii and in Egypt may help to account for this affinity, since any such group would tend to write an alien language phonetically rather than conventionally. Aside from this tendency, specific Greek influence on the orthography of the papyri is slight.

## LINGUISTICS

### A QUANTITATIVE ANALYSIS OF CONSONANT CLUSTERS IN PRESENT-DAY ENGLISH

(Publication No. 2473)\*

Betty Jane Wallace, Ph. D.  
University of Michigan, 1951

This study is an attempt to analyze and present quantitative information concerning consonant clusters in spoken English. A practical necessity, that of preparing adequate materials for the teaching of English pronunciation to foreign students, was the motivation for the study and dictated the approach to the problem.

Mechanically recorded conversations of more than 10,000 running words were used in this analysis. The conversations were recorded without the knowledge of the speakers, in order to avoid an unnatural style of speaking or an affected pronunciation.

Quantitative information is given on the relative frequency of the following in spoken English:

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\* Microfilm copy of complete manuscript of 163 pages, \$2.04. Enlargements, 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-216.

1. Syllable initial and syllable final consonant clusters
2. Combinations of syllable initial and syllable final consonants and/or clusters in medial position in words and utterances
3. Consonant phonemes occurring in initial and final clusters and medial combinations

Appendix II contains a detailed list of examples of the 695 various combinations of consonants and clusters appearing in medial combination within words and utterances. A critical survey of previous analyses of consonant clusters in English is also presented in this study.

The results of the study indicate that the majority of the initial clusters which can potentially occur in English were encountered in the recorded data. On the other hand, relatively few of the final clusters which may potentially occur in English appeared in the data. Certain items of both types of clusters (initial and final) occurred with relatively high frequency and the remaining items appeared infrequently. The medial combinations of consonants, which have often been described as being composed of all the possible combinations of initial and final consonants and sequences of consonants, were found to be strictly limited. No sequence of more than 5 successive consonants was recorded. In fact, 98.2% of all medial combinations contained no more than 3 successive consonants.

Furthermore, the systematic simplification of final clusters in medial position reinforced the above evidence. Sequences of two or three consonants in syllable final position are often reduced in one of two ways: 1) by the omission of one phoneme (a stop consonant in a sequence containing a stop and a fricative, or a fricative in a sequence containing two fricatives); 2) by the breaking up of final clusters at syllable boundaries where the final consonant moves forward into initial position in the following syllable.

From the information gained in this study it is clear that not all sequences of consonants in English occur with the same frequency. It is to be hoped that through the use of the lists and quantitative information furnished herein more satisfactory materials for the teaching of the pronunciation of English consonant clusters to students of other language backgrounds may be developed.

## LITERATURE

### THE MEANING OF NON-SENSE: A PSYCHOANALYTIC APPROACH TO LEWIS CARROLL

(Publication No. 2337)\*

Deborah Bacon, Ph. D.  
Columbia University, 1950

This study attempts to demonstrate, from the psychoanalytic point of view, a parallelism between the known character and life of Charles Lutwidge Dodgson and the latent meaning, symbolism, and intent in his literary creations. Dream symbolism and the modes of unconscious thought, as set forth by Freud, are taken as the common factor among Carroll's life-attitudes, his creative writings (largely couched in dream-fantasies), and his humor.

A chapter on Dodgson's biography and character, as reported by many late-Victorian reminiscences as well as by his nephew and official biographer, is followed by a detailed exposition of the Compulsion-Obsessive character-type developed according to the Freudian school. This is correlated with a "profile" of the Oxford don.

A discussion follows concerning the relation of Non-sense to literature and Comedy. This is based upon and is an extension of Freud's "Wit and Its Relation to the Unconscious." Attention is paid to the sudden vogue for Non-sense which arose in XIXth century England. The tentative reasons offered for this are sociologically, as well as psychoanalytically, based. Nonsense is differentiated from satire, parody, and gibberish.

A detailed study of Carroll's marked gifts as parodist follows. This includes an attempt to recognize as many of his scattered parodies as possible as well as a line-by-line, psychoanalytically oriented study of one minor parody and an interpretation of "The Walrus and the Carpenter" in terms of the Oedipus complex.

The Hunting of the Snark is examined as an artistically unsuccessful, symbolic discussion of castration-fears and Sylvie and Bruno is considered in terms of depersonalization and of a schizophrenically abstracted over-concern with the problem of Time, per se.

The two Alices are discussed from many psychoanalytic angles, such as: the Queen as the "phallic mother"; the doubt

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\* Microfilm copy of complete manuscript of 276 pages, \$3.45. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-81.

of identity; the magic quality of food and its equation with love; the contrasts between the two dreams, both as literature and as symbolic monologues upon unconscious problems; dream concepts of Space and of Time. Sir John Tenniel and Carroll are contrasted as illustrators of the same book. The world-wide popularity of Alice is noted in conjunction with the extreme difficulty of its translation. A few paragraphs in French, German and Pidgin English are quoted.

Throughout, emphasis has been laid on the fact that there exists, as yet, no established psychoanalytically-based aesthetic. Therefore, the psychoanalytic study of the man and the literary criticism of his work have only been presented as striking parallelisms and not as a cause-and-effect relationship whose intermediate linking steps could be demonstrated.

The danger of psychoanalysis of a man in absentia has been recognized. But the conclusion of the psychoanalytically-based train of thought has been carefully limited to a working hypothesis, only. Its value lies in the facts that it is internally consistent and that, as a working hypothesis, it becomes productive of further insights not only into the artist but into his art.

#### THORNE SMITH: A STUDY IN POPULAR FICTION

(Publication No. 2368)\*

Joseph Leo Blotner, Ph. D.  
University of Pennsylvania, 1951

This is the study of both a man and a literary phenomenon. It is a consideration of the work of Thorne Smith and, through it, the phenomenon he typifies: the author who enjoys tremendous popularity without being brilliant or highly distinguished.

Family manuscripts and the reminiscences of friends and acquaintances supply the materials for his biography. After a rather unhappy childhood, spent chiefly at boarding schools and the homes of relatives, Smith entered Dartmouth only to leave after two years to write advertising copy in Manhattan. After editing a Naval Reserve magazine during World War I, he went to live and write in Greenwich Village. Marriage forced him back into advertising to earn a living, and his liberation from it came after nine years of struggle. He had just begun to find

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\* Microfilm copy of complete manuscript of 205 pages, \$2.56. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-112.



financial security, after comparative poverty, and was on the threshold of his greatest success when death came.

After his first successes in the comic novel he followed a formula embodying the elements that had contributed to those successes, so that his later books lost the freshness that had marked the first ones, being very like them in type and structure and even in character and incident. In this formula a well-to-do executive in his middle thirties is unhappy in his marriage or in his highly conventional life. A strange physiological condition or a set of wild new companions leads him into mad-cap escapades replete with Irish cops, battle and flight, chases and court scenes, and a brief idyll between the two principal characters just before the climax and denouement. Also encountered are faithful family retainers and individualistic pets, while the season is usually summer and the locale is New York City, its suburbs, or the seashore. These far-ranging adventures finally leave the hero with a new, more enlightened and tolerant set of values and sometimes a new, compatible mate as well. Almost always present are plays on words using the human eliminative functions for comic material. There is also immorality, chiefly through the actions of Smith's characters, who often engage in adultery or illicit affairs with his obvious approval, although no vivid descriptions of carnality appear. All this is accompanied by the consumption of copious quantities of hard liquor, with much resultant intoxication. Satire and social commentary appear on topics such as advertising, big business, religion, the economic system, currently accepted codes of sexual behavior, social injustice, and the bigotry and prejudice he saw around him.

Collation of first draft manuscripts with published texts show extensive deletions (by Smith's editor) of offensive or unnecessary passages as well as too-serious or extraneous satire and social criticism.

Smith's fourteen books were published by over a dozen houses in America and at least that many abroad. The books appeared in more than fifty American editions, having over two hundred and twenty-five American printings, while the gross American sales have passed the thirteen million mark.

Thorne Smith might have done well in writing editorials, articles, mystery novels, or books for juveniles, while his chances for success were small with the serious novel, poetry, and the short story. He had conspicuous success in his own form of the comic novel, and when he tried to turn from it to the serious novel, he was met by the unyielding resistance of his editors and publishers. This was fortunate for both Smith and his public, for in the comic novels he had found his true metier and achieved his greatest success.



THE CUBAN NOVEL:  
A STUDY OF ITS RANGE AND CHARACTERISTICS

(Publication No. 2478)\*

Jo Ann H. Boydston, Ph. D.  
Columbia University, 1950

The purpose of this study has been to investigate the novels written in Cuba in order to determine the principal characteristics of the novels. Another major purpose has been the presentation of this data in a form which would be most helpful to all those interested in Cuban literature.

The bibliographies were first compiled from consultations of the work of recognized Cuban bibliographers, such as Carlos Trelles. Their listings were supplemented by an exhaustive study of the notes of periodicals concerning recent publications, surveys of booksellers' catalogues and publishers' lists. The resulting bibliographies were further checked against the bibliographical work of J. D. M. Ford. After establishing the criteria of length and subject matter, works under 25,000 words and those concerned with events outside Cuba were eliminated. The novels themselves, in addition to the available critical studies of writers and works, were then examined individually.

The general subject matter treated in the works was the basis for the classification of the novels into groups. The broader emphases evident in the treatment of that subject matter transcend and include the subject matter classifications, and are called trends. More specific emphases apparent in treating the subject matter are also presented as the basis of determining the various characteristics of the groups during the whole development of the Cuban novel.

The procedure outlined above revealed that the Cuban novels, according to subject matter and to some degree, treatment, form several major groups which have been labelled: novels of customs, historical novels, sentimental novels, psychological novels and socio-political novels. Each of these groups is the expression of one of the basic emphases found in the Cuban novel. The novels of customs and the historical novels represent a stress on the physical aspects of life in Cuba; the sentimental and psychological novels, an interest in the inner life of the Cubans, and the socio-political novels, the most recent stress on social and political problems and the interest in relationships within groups and between groups.

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\* Microfilm copy of complete manuscript of 154 pages, \$1.93. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-221.

In addition to the discussions of the broad emphases and characteristics of the Cuban novel and these bibliographies, the study includes a bibliography of general critical works, of specific studies of novelists and novels, and an index guide to the novelists and their works. The principal value of the investigation is the determination of the most important trends throughout the history of the Cuban novel. In addition, as the only work up to the present in which the whole development of the Cuban novel is studied, it has the added value of presenting the pertinent bibliographical data in one volume. For these reasons, it should be useful not only as an introduction to the Cuban novel, but also as a guide to further study and as a comprehensive view of the development of the Cuban novel.

### THE ROMANTIC NOVEL IN MEXICO

(Publication No. 2479)\*

John Stubbs Brushwood, Ph. D.  
Columbia University, 1950

From the end of the Period of the Struggle for Independence to 1850 the few novels produced in Mexico possess characteristics of Romanticism, but practically all of them are historical — a kind not treated in the present study. In general, these novels are short, have plots that appear condensed, and reveal the lack of a tradition in the production of prose fiction as well as the hectic society in which they were produced. The only novelist of that period who may be considered a worthy successor to Fernández de Lizardi was Manuel Payno. His novel, El fistol del diablo, is the only good portrayal of Mexicanism and the only example of the natural realism that is a part of the Lizardi tradition.

The progress of the Mexican novel from 1850 to the predominance of Realism around 1890 is divided at the year 1867 because of the work of Altamirano toward the establishment of a tradition, toward portrayal of the typically Mexican, and toward good taste. As to content, the novel is divided into the amatory and the novel of customs. In the amatory novels, there is little Mexicanism, the authors' purposes being the exaltation of love and the achievement of an idyllic or exotic effect. After 1867, the growth of Mexicanism and the coming of Realism

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\* Microfilm copy of complete manuscript of 206 pages, \$2.58. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-222.

caused fewer purely amatory novels to be written. The novel of customs is generally longer and more complicated. Influences of foreign novelists like Balzac, Dumas, and Sue are frequently claimed by the Mexicans, and indeed they are sometimes apparent, the influence of Sue being the most obvious.

In general, the novels of customs portray Mexican society quite superficially. Favorite themes are filial respect, conjugal honor, the power of money. Rarely does the novelist reveal any genuine understanding of Mexico and its problems. A few novelists are noteworthy for their portrayal of Mexico and belong to what may be called the Lizardi tradition: Payno, Inclán, Cuéllar and, to a certain extent, Roa Bárcena and Altamirano. These men were not as slavishly dependent upon their foreign models as were their contemporaries, and were able to see and appreciate Mexico. It was their work that prepared the Mexican novel for the acceptance of Realism as it is found, mixed with Romantic exaggeration, in the works of men like Martínez de Castro, Castera, and Payno in his last novel.

Although some simple plots are found among the amatory novels, both the latter and the novel of customs generally have very complicated plots and many improbable coincidences. Some novelists had enough narrative skill to weave strong plots, many more become confused. Characters are usually completely good or completely bad; shading is rare. Mexican types are found occasionally, especially in the novels of the Lizardi tradition. Treatment of the lower class is uncommon; such people are presented as criminals or as virtuously trying to emulate their social superiors. There is some dialect, but this is usually handled unskillfully.

The novelists were sometimes successful in their exaltation of love, but more often they became absurd. The social view reveals little of Mexico; the cheap philosophy which accounts for innumerable digressions is disgusting. Many of the novelists write carelessly, or with an affected but ineffective style.

In spite of all their faults, there is a marked improvement in all respects throughout the period. Some excellence is always to be found, especially in the followers of Lizardi; and after 1867, the improvement is more consistent and obvious — toward more integrated plots, more logical characterization, and more careful prose.

# A SEVENTEENTH CENTURY MEXICAN LIBRARY AND THE INQUISITION

(Publication No. 2389)\*

Donald Garner Castanien, Ph. D.  
University of Michigan, 1951

This study is an analysis of one of the most extensive private libraries in seventeenth century Mexico, a book collection significant because it is a reflection of the relatively close connection that the Spanish American colonies had with Europe and Spain, particularly. The library was owned by Melchor Pérez de Soto, whose interest in judicial astrology was the cause of his being denounced to the Inquisition. Several persons testified that the architect not only practised judicial astrology, but also owned forbidden books. As a result, Pérez de Soto was arrested and his library of some fifteen hundred books was impounded.

During his trial, Pérez de Soto admitted that he had cast horoscopes but said that his only interest in astrology lay in discovering whether there was any truth in it. After several months' imprisonment, Pérez de Soto became unbalanced and attacked his cell-mate, who killed him in self defense. Pérez de Soto's widow petitioned the Inquisition to return her husband's books, most of which she planned to sell as waste paper.

An examination of the contents of Pérez de Soto's library indicates that he had a wide range of interests. His taste in belles-lettres was evidently not much different from that of many of his contemporaries, for he owned novels of chivalry, picaresque and pastoral novels, short stories, poetry, dialogues and essays. The imaginative literature in the collection was, for the most part, the work of Spanish authors, but it also included foreign works, both in the original languages and in translation.

Though a large part of the non-fiction in the library bore directly upon Pérez de Soto's profession, practically all fields of learning were represented. The collection of non-fiction was sufficiently broad to give a cross-section of European thought in the sixteenth and early seventeenth centuries. It also included works by the ancients and by medieval scholars.

In his choice of religious literature, Pérez de Soto again displayed wide interests. He owned the writings of some of the

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\* Microfilm copy of complete manuscript of 302 pages, \$3.78. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-133.



great Spanish mystics and ascetics, some exegetical works, many histories of the Church and the various orders, and lives of the saints, along with a great many devotional works.

After Pérez de Soto's death his books were submitted to the Inquisition's Examiner of Books to discover whether any of them were forbidden. Considering the size of the library, comparatively few prohibited books were found. The majority of these were astrological treatises, some condemned because of the contents and some because the authors were heretics. In some cases the examiner recommended that the books be submitted to a more learned person for final judgment, thus suggesting that censorship was not always placed in the hands of qualified persons.

The presence of a library such as Pérez de Soto's indicates that seventeenth century Mexicans were in relatively close touch with European intellectual activity. The long standing idea that the Spanish American colonies were deprived of the opportunity to keep abreast of European thought is not based on fact.

LYDGATE'S LIFE OF OUR LADY  
A CRITICAL EDITION OF BOOKS I AND II

(Publication No. 2459)\*

Ralph Albert Klinefelter, Ph. D.  
University of Pennsylvania, 1951

This dissertation is a critical edition of Lydgate's Life of Our Lady (Books I and II). Prepared under the supervision of Dr. Albert C. Baugh, the edition is a part of a larger project by which the entire poem will be made available. Books III and IV are being edited by Fr. Vernon F. Gallagher, and Books V and VI by Fr. Joseph A. Lauritis.

John Lydgate (c. 1370-1449), Benedictine monk of Bury, wrote the Life of Our Lady in 1421-1422\*\* at the suggestion of King Henry V. The poem, comprising 5932 lines, is written in rhyme royal, except for a paraphrase of the Magnificat, in ten 8-line stanzas (II, 981-1060). In content, the poem is a pious

\* Microfilm copy of complete manuscript of 303 pages, \$3.79. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-202.

\*\* The author of this dissertation rejects the 1409-1411 date first suggested by Prof. Josef Schick (Temple of Glas, EETSES, 60, p. cviii), and offers evidence towards establishing the 1421-1422 dating.



account of the life of the Virgin Mary from her birth to the Purification. Major incidents are: the birth of the Virgin, her early years, her marriage to Joseph, the allegory of the Four Daughters of God, the Annunciation, a trial by drinking proving Mary's virginity despite her pregnancy, the Birth of Christ, the Circumcision, the Epiphany, and the Purification.

This edition of Books I and II consists of an Introduction, the Text (with variants), Explanatory Notes, and a Glossary. Subjects treated in the introduction are: a brief literary history of the Life of Our Lady, the date of the work, its source, the relationship of manuscripts, and the choice of the basic manuscript for the text.

The Life of Our Lady is extant in forty-one MSS. By means of microfilm all the manuscripts were examined and collated except MS Mostyn Hall 85 and MS Mostyn Hall 257, the present location of which cannot be traced.

The Durham University MS Cosin V. ii. 16 has been chosen as the text for this critical edition of the Life of Our Lady. The manuscript is early, dated as, "circa 1450, with perhaps a preference for a minus rather than a plus." It is fairly complete and correct, and in many lines seems to represent the better textual tradition.

#### DIDEROT AND GIDE: A MEETING OF MINDS

(Publication No. 2485)\*

George Norman Laidlaw, Ph. D.  
Columbia University, 1950

This is a study of the intellectual incidence of two of the most original and multifaceted of French minds. It is obvious that the relationship is an unusual one: the authors are of markedly different temperaments, periods and literary atmospheres; there is no evidence of inordinate admiration, of direct borrowing, of traceable lines of influence. And yet it exists, this strange affinity of intelligences — a careful rereading of the works of each reveals a concurrence of ideas, techniques and convictions which leaves no doubt of the meeting of minds, whatever may be the "chaîns imperceptibles."

The separate rapports are grouped in divisions that are graduated from the general to the particular: Likenesses of

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\* Microfilm copy of complete manuscript of 208 pages, \$2.60. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-228.

attitude are taken as a point of departure, with the emphases on intellectual curiosity, love of challenging questions, the scientific outlook, polarisation and dédoublement, associative thinking and mental discipline. Similarities of approach and of technique in dealing with matters of major and minor concern are the subject of the second chapter: Diderot and Gide are creatures of dialogue, fond of contrasts, oppositions, balanced extremes; both are preoccupied with enchaînement and inconséquence, given to indicating directions and leaving endings inconclusive; each portrays character vividly, depending largely on dramatic gesture. The third chapter considers an essential attitude and its presentation in the works of both authors: folly and its prevalence in La Sotie humaine, stressing sots and sottises, Gidean soties and their counterparts in Diderot. It is followed by an examination of two treatments of a serious theme, blindness: there is a like perspective in the observations by Diderot and Gide of the malady's physical, spiritual and intellectual manifestations and their cures. Problems in conduct, both individual and social, are surveyed and related under a separate rubric; the main divisions are sexual morality and the question of human virtue. The sixth chapter is an investigation of Gide's acquaintance with Diderot's writing, based on specific references and their relation to Gidean works.

In the brief conclusion, rather than a summary of earlier arguments, there are: first, an indication of the broad similarity of the authors' places in philosophy, sociology and esthetics; second, an intimation of the increasing critical recognition of their rapports; and finally, an estimate of the total relationship — it is an instance of what Gide calls "influence . . . par ressemblance."

#### STEFAN ZWEIG'S BIOGRAPHICAL WRITINGS AS STUDIES OF HUMAN TYPES

(Publication No. 2433)\*

Gerard Maximilian Mertens, Ph. D.  
University of Michigan, 1951

This is a study of Stefan Zweig's biographical writings as contributions to typology. A distinction is made between those of his biographical works that are typological and those that are

\* Microfilm copy of complete manuscript of 377 pages, \$4.71. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-177.

not, and the typological biographies are divided into two classes, the "intentionally typological" and the "unintentionally typological." The term "intentionally typological" refers to those works which Zweig planned as direct contributions to what he meant to be his lifework, a typology of the spirit; while the term "unintentionally typological" refers to those which, though seemingly typological, as opposed to individualizing, were not explicitly conceived by Zweig as such contributions. The term typology of the spirit ("Typologie des Geistes") indicates a close relationship between the human type and the mind. It becomes the problem of this study, then, to establish the boundaries between the "intentionally typological," the "unintentionally typological," and the "non-typological" biographical writings of Zweig, and to evaluate his intentionally typological biographies.

After an introduction, a short survey of Zweig's work, and a theoretical exposition of the problem, the main part of the dissertation, is dedicated to the analysis of Zweig's biographies from the typological point of view. In one chapter the sixteen biographies which are considered as intentionally typological and therefore as belonging to Zweig's typology of the spirit are treated. In each case the assumed type, the choice of the person, and Zweig's success in presentation are considered. In the next chapter the unintentionally typological biographies are discussed; in the following chapter the remainder of his biographical work, and later in a very brief chapter Zweig's intentionally typological, though non-biographical, works are taken up. The classification used is determined mainly by the works themselves and by Zweig's statements concerning his typological efforts. The opinion of Zweig's critics is not disregarded. In order to substantiate this classification, as well as to judge Zweig's success, ample quotations from his works are given.

By finding and demonstrating that the majority of Zweig's lifework was devoted to one coherent purpose, the unity of his literary work is presented. Zweig created in the field of biography a work comparable to that which his master, Balzac, had created in the field of the novel. At least the works listed as intentionally typological, and possibly, some of the unintentionally typological biographies, are shown to be parts of one great and unique literary effort. In regard to the success of his presentations, most of his portraits are considered to be highly valuable contributions to his typology. (Among all the intentionally typological biographies only that of Dickens is to a large extent unsatisfactory.)

In conclusion it must be stated that, whereas Zweig is generally recognized as an outstanding stylist, the basic concept of

his lifework, the typology of the spirit, has not yet been sufficiently appreciated, and it is to be hoped that this study may make possible a more just evaluation of Stefan Zweig in the future amongst scholars and laymen.

## THE EVOLUTION OF THE CONCEPT GESAMTKUNSTWERK IN GERMAN ROMANTICISM

(Publication No. 2439)\*

Alfred Robert Neumann, Ph. D.  
University of Michigan, 1951

This study undertakes to outline the evolution of the concept of the Gesamtkunstwerk among the German romantic authors, and to illumine thereby the birth of nineteenth century opera out of the spirit of literary romanticism. It traces the history of an idea as it was first carried by the professional musicians, and was then gradually espoused by the literati during a period in which opera was largely music-dominated.

The term "Gesamtkunstwerk" is not glossed in any dictionary. Therefore the only available definition, in Wagner's Das Kunstwerk der Zukunft, was quoted at the outset. This definition and the creation of school-examples, it was found, were the main achievements of Wagner in respect to the Gesamtkunstwerk. The idea was by no means his creation, but was part of the climate of critical opinion of his time.

This dissertation in no way tries to concern itself with Wagner and his art as such, but to explain the history of one idea which he happened to adopt and apply. For that purpose it was necessary to discuss the evolution of the Gesamtkunstwerk concept in literature from the publication of Gottsched's Versuch einer kritischen Dichtkunst (1730) to the death of C. M. von Weber (1826).

The point of departure is a low-point of German opera appreciation, reflected in the rejection of opera per se on the part of Gottsched. However, the contemporary abuses of that form, it is then pointed out, were soon recognized, deplored, and assailed, and reforms were demanded and instituted. Lessing still stood aside and feebly echoed the musical views of his friends. Sulzer and Heinse were able to draw for critical inspiration upon the operas of Gluck and accordingly envisioned a

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\* Microfilm copy of complete manuscript of 248 pages, \$3.10. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-183.



reformed opera which approached a balance of its major components. Wieland and Goethe tried their genius in the preparation of operatic librettos, elevating that previously despised labor to a position of relative esteem.

Under the impact of the new experience of music as a living force and with the social and economic changes of the turn of the century a new literature was born, one of whose aims it was to emulate the effects of music by any artistic means. This brought about a preoccupation and experimentation with the union of the arts. Herder and Wackenroder injected this awareness of music into the stream of literature, Tieck perpetuated and popularized its application, the Schlegel brothers gave it their theoretical blessing, and a number of minor writers (Görres, v. Collin, and v. Mosel) and several philosophers (Schelling, Schleiermacher, Solger) each contributed their personal attitudes. Schiller's drama *Die Braut von Messina*, Ph. O. Runge's paintings, Novalis' novel *Heinrich von Ofterdingen*, E. T. A. Hoffmann's opera *Undine*, and C. M. von Weber's late operas were examined as endeavors to create a Gesamtkunstwerk through different approaches. The operatic quality of Novalis' novel, apparently heretofore unrecognized, was elaborated particularly.

Although much of the factual information contained in this thesis is widely accessible, it is here brought together and interpreted for the first time to illustrate the evolution of the concept of a Gesamtkunstwerk among men of letters, and thus to set forth that the Gesamtkunstwerk was, for a time at least, not a musical problem, but primarily the concern of literature. Significantly, the conclusion must be drawn that the term "Gesamtkunstwerk" needs to be re-defined. It does not necessarily denote an opera: a painting (Runge) or a novel (Novalis) can also be the starting point, while opera can at best be called a particular type of Gesamtkunstwerk.



BASIC THEMES IN THE LYRIC POETRY  
OF MAX DAUTHENDEY

(Publication No. 2441)\*

Roger Cecil Norton, Ph. D.  
University of Michigan, 1951

This study of the lyric poetry of Max Dauthendey (1867-1918) aims to ascertain and describe his lyric themes, keeping constantly in mind the fact that his work was a true reflection of his personality and an evaluation of the civilization that produced him.

Certain basic themes — nature, love, exoticism, homesickness and yearning — characterize the poems, and are studied in the order of their appearance as leading motifs. However, they are frequently intermingled in the poet's work, so that a study of them cannot be purely chronological.

Nature is the most common setting for Dauthendey's lyrics, reflecting his every mood. It is a colorful, dreamlike world, recorded by means of emotional and sense impressions, as the poet immersed himself in the life of nature, seeking complete communion with all things as parts of an essentially joyful, self-determined, and closely-linked universe.

Love is glorified as the greatest creative power in the world and as a religion replacing orthodox dogma, based on the dictates of the heart, not the mind. The poet was very dependent on his wife's affection, showing an almost abject need for strength to protect him against cruel reality. Yet he showed great reverence for life as essentially good and worthwhile in all its forms, and in its sorrows as well as its joys.

Exoticism is a general characteristic of Dauthendey's poems and defines his flight from his time into the colorful, sensual, and contemplative world that he envisioned in his dreams. The Orient came to represent the goal of his desires, but even there his rationalistic traits, together with his strong attachment to his wife and country, kept him from surrendering to the spirit of exoticism. His poetry maintained an objective contact with reality, in spite of its subjective, romantic characteristics.

Homesickness and yearning set the tone for the poet's last years of virtual internment in Java during the World War. The

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\* Microfilm copy of complete manuscript of 196 pages, \$2.45. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-185.

sexual and intellectual frustration attendant on this involuntary separation, the shame at being unable to help his country, and the feeling of utter isolation and rejection in a hostile atmosphere, wore ever more strongly on his spirit. He sought consolation in nature and the exotic scenes, and also in his philosophy of festive existence ("Weltfestlichkeit"), to which he now joined the concept of a personal God. But reason and hope gave him no real relief.

This study shows Dauthendey as a man divorced from the civilization of his time, partly through intellectual conviction, partly through failure to face up to the demands of life. His strength as a poet lies in his ability to see beyond externalities and to picture the world with extreme perceptivity, yet with an engaging, simple musicality. He reached beyond temporality in his search to illuminate the spiritual life of all things and to find eternal values within them.

#### THE TREATMENT OF QUAKERISM IN AMERICAN HISTORICAL AND LITERARY WRITING

(Publication No. 2467)\*

Edward Earle Stibitz, Ph. D.  
University of Michigan, 1951

The Treatment of Quakerism in American Historical and Literary Writing seeks to discover how Quakerism — the beliefs and practice of the Society of Friends — has been dealt with in representative writing from the mid-seventeenth century to the present. The aim is primarily to determine the fairness of the treatment and to trace shifts in attitude. The significance of the findings are indicated in two related areas: that of American intellectual and social history, and that of the techniques of historical and literary writing.

Of the histories dealing with Quakerism those analyzed are selected because of their historiographical importance, and the literary works because of their major use of Quaker themes. The materials are considered in three divisions based on changing emphases in American thought: the Puritan Period, to about 1725; the Age of Humanitarianism, to the Civil War; and the Era of Scientific Naturalism, to the present. The validity of this partition is established in the investigation.

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\* Microfilm copy of complete manuscript of 290 pages, \$3.63. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-210.

The investigation discovers that the treatment of Quakerism, although uneven, improves in the effectiveness and sympathetic nature of the characterization of Quakerism and in the technical skill of the writings. In the Puritan Period, the treatment is hostile, largely for religious reasons. With the decline of Puritanism the writings are more favorable, partly because rationalistic thought misinterpreted the humanitarian aspects of Quakerism. Later, the Quaker antislavery work also favorably influenced opinion. In the Era of Scientific Naturalism, although the dominant spirit was antithetical to Quakerism, the most understanding pictures of the faith are presented. This is to be explained by the increased objectivity of much writing, chiefly the historical, and by the influence of anti-naturalistic elements in American thought, particularly upon literature.

The findings suggest clarifications and qualifications of present views in intellectual and social history. The view of Puritanism as dominating early American thought is qualified by a new awareness of the place of Quakerism; and, as a subsequent influence in American life, Quakerism is seen as more nearly the equal of Puritanism. The clarification of the relations between the two systems reveals a basic similarity that is a cause of the persecution of the Quakers. The humanistic nature of later rationalistic thought is specifically inferred by its partially mistaken approval of Quakerism. Similarly the character of recurring nationalism is suggested by the attacks upon Quaker pacifism. The more recent treatment of Quakerism reveals significant challenges to the dominant spirit of scientific naturalism which indicate a movement toward some kind of supernaturalism. Again, the findings imply a growing religious tolerance, although it might be construed as religious indifference.

Besides offering insights into the nature and history of American historical and literary writing, this study indicates that histories can offer a more consistently effective treatment of a belief like Quakerism, but that literary works can give the best individual pictures of such a mystical faith. Two further conclusions are drawn: first, that the technically superior histories are logically more effective in dealing with Quakerism; second, that the relatively simple rather than the philosophically sophisticated literary work is most successful in presenting Quakerism, and that an author needs a profound understanding of Quakerism fully as much as he needs technical literary skill.

THE SEA, THE CITY AND THE CLOCK: A STUDY OF  
SYMBOLIC FORM IN THE NOVELS OF VIRGINIA WOOLF

(Publication No. 2357)\*

Jean Sudrann, Ph. D.  
Columbia University, 1950

The Sea, The City and the Clock presents a textual analysis of the novels of Virginia Woolf as a means of illuminating the symbolic elements which are the basis of their form and meaning. Mrs. Woolf's own critical writings provide the necessary definitions of the nature of the novel and the symbol. She develops a poetic novel whose center of interest lies not in "what happens next" but in the examination of what is happening now. The abandonment of the conventional technique of plot leads her to thematic development as a means of structural unification. This search for a new form includes the desire that the novel epitomize rather than present an inventory. It becomes, then, a search for symbolic form.

Through the character of Lily Briscoe in To the Light House, Virginia Woolf presents her definition of the symbol. It is a "globed compacted thing," expressive of a plurality of meaning and presented through the medium of specific sense materials. This accords with definitions suggested by other artists, philosophers, and psychologists. In each case, some extra-sensory universe is postulated whose forms the artist attempts to express through the materials of the sensory universe. From the rhetorical point of view, this suggests a progress from image through metaphor to symbol. It is possible to trace, thus, the genesis of the symbol in Mrs. Woolf's novels and it is ultimately seen as an integral part of the work, extended throughout as a determinant of the double aspect of form and theme.

The symbol of the city, of basic importance in the shaping of Night and Day, Mrs. Dalloway, and The Years, is a means of communicating that interrelationship of human beings which can be defined as civilization. It is, thus, both a sign of triumph and of disaster. London exemplifies an unparalleled peak of social organization at the same time that it demonstrates an almost inconceivable extent of physical and spiritual slaughter. The relation of the individual to this communal achievement is carried through the room which marks his isolation and the party

\* Microfilm copy of complete manuscript of 310 pages, \$3.88. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-101.



which reveals the self discovered through its relation to the civilization which is its social heritage.

The characters of The Voyage Out, To the Light House and The Waves make the journey over the sea instead of through the city. Their development is that of the individual in relation to himself. The sea is that inchoate mass of Being from which meaning can be wrung only by human will and understanding. The final expression, in The Waves, of a fin turning in the waste of waves, the individual life showing momentarily above the flow of the living stream only to be reabsorbed again, represents the concept basic to the creation of the symbol.

A similar cyclical emphasis is found in the use of the time symbol in Orlando and Between the Acts. Close to Bergson and Proust in her concept of time, Virginia Woolf plays a variety of times against each other. Clock time provides a norm and its image is simply the sound of the striking clock. Inner time, personal to the individual, negates the chronological series of hours by its totality of past and present which in itself constitutes the future. Finally, there is historical time, the hoarded hours of the past in which every moment has its setting. Only a composite vision of the three can adequately define that "now" whose exploration is the primary concern of Mrs. Woolf's novels.

RUDYARD KIPLING, L'ILLUSTRE ÉCRIVAIN  
A STUDY OF THE FAME AND FORTUNES  
OF RUDYARD KIPLING IN FRANCE

(Publication No. 2361)\*

William E. Weld, Jr., Ph. D.  
Columbia University, 1950

Chapter I:

The Kipling Vogue.

Rudyard Kipling's vogue, one of the most extraordinary ever enjoyed by a man of letters, invites reconsideration of Kipling's place in literary history. Analysis of his fortunes in France may assist to fix that place correctly.

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\* Microfilm copy of complete manuscript of 510 pages, \$6.38. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-105.



## Chapter II:

## Kipling Conquers France.

A few critics tried unsuccessfully to interest the French in Kipling during the early days of his fame. Then chance enlisted simultaneously in his behalf the complementary skills of superlative translators (Louis Fabulet and Robert d'Humières), a vigorous publisher (Henry D. Davray), and a distinguished critic (M. André Chevrillon). Their efforts combined to bring the Jungle Books triumphantly before the French. By April 1899 Kipling had become in France "l'auteur étranger à la mode."

## Chapter III:

## Publication Facts and Figures.

Publishing statistics trace the development and durability of this new fame. From 1899 through 1903 the French read Kipling as fast as he could be translated. A declining popularity in the ensuing years was checked in 1907 by his selection for the Nobel Prize for literature, which established him as a "classic." Since then the sales of Kipling's work in France reflect the steady appeal of an accepted master, though since his death in 1936 public interest has been directed rather exclusively to a few well-known titles.

During the fifty years of his fame in France, fifty-six translators have rendered into French two million of his words, omitting nothing of significance from his books except an adequate sampling of the later "Kipling that nobody read." Most of this material found its way into twenty or more periodicals, principally the big reviews. But periodical publication did not prevent forty-four publishing firms, headed by the *Mercure de France*, from bringing out one hundred and forty editions of translations, which sold about two and one half million copies. All the work except the poetry had at least a moderate success, the largest sales being recorded for: The First Jungle Book (362,000), The Second Jungle Book (276,000), Plain Tales From the Hills (300,000), Captains Courageous (300,000), The Light That Failed (250,000), Kim (100,000), and various collections of short stories whose sales between 1919 and 1939 alone have been computed at 325,000.

Chapter IV:  
The Popular Reception.

The conclusion from these figures, that perhaps only Shakespeare and Dickens among English writers ever scored a greater triumph in France than Kipling, is supported by the evidence of his popular reception both as an artist and as a man. Dingley, l'illustre écrivain, a novel by Jerome and Jean Tharaud which depicts Kipling as a blind, self-centered imperialist, is a minority report. Most French approved his selection for the Nobel Prize, his honorary degrees from the universities of Paris and Strasbourg, his election to the Académie des Sciences morales et politiques, his burial in the Poet's Corner of Westminster Abbey. Their final verdict on him was: "une lumière qui ne s'éteindra pas."

Chapter V:  
Causes and Effects.

The extraordinary success in France of "le chantre de l'impérialisme britannique" is not fully explained by superficial factors like good translations, wide critical acclaim, concentrated periodical support. Kipling's world-wide notoriety first turned French attention toward him, but his vogue endured in France, as in England, for more basic reasons. (1) His work had a universal, rather than a narrowly British, appeal. (2) The originality and freshness of his matter and manner captivated a public bored with "l'éternel roman des gens du monde et leur chétives ou prétentieuses passions." (3) His narrative gifts were congenial to French taste. (4) More important still, his virile message of energy and discipline appealed to a generation effecting in France a "relèvement national." (5) Finally, after 1914, Kipling consolidated himself in French esteem by an outspoken distrust of the common enemy, Germany, and by his amply demonstrated friendship for France.

Conclusion:

The French judgment on Kipling merits consideration, for it is informed, objective, unanimous. That judgment: Rudyard Kipling is "l'illustre écrivain."

## MATHEMATICS

### A STUDY OF THE VARIATION IN THE MOMENTS OF A FREQUENCY DISTRIBUTION DUE TO GROUPING

(Publication No. 2378)\*

Fred A. Beeler, Ph. D.  
University of Michigan, 1951

An investigation of the relation of the raw moments of a sample to the true moments of the population, while desirable, would be a difficult task. Therefore this study which is undertaken as an approach to the problem is restricted to an investigation of the variation due to grouping of the raw moments of a population. It is hoped that this will shed some light on the more general problem.

Equating the  $k$ th raw moment to its Fourier series as introduced by R. A. Fisher is the principal method used. From this we are able to obtain an expression for the variation of a raw moment from its average value. This variation is also expressed as the remainder term of the Euler-Maclaurin sum formula but this method proves to be unsatisfactory.

Several important results are:

a. A bound is obtained for the variation in the  $k$ th raw moment from its average value. Tables are presented which exhibit these bounds for the normal, Charlier type A, Pearson type III and rectangular distributions.

b. A relationship is established between the order of convergence of the Fourier series of the raw moment and the orders of the contact and continuity of the distribution function.

c. The variation due to grouping in the  $k$ th raw moment of the Pearson type III distribution does not decrease monotonically as the order of contact increases. However a monotonic decreasing function is obtained which bounds it.

d. It is shown that the conditions of high contact and continuity of high order on  $f(x)$  are not sufficient conditions for the ordinary development of Sheppard's corrections.

e. For the  $\beta$ -distribution it is shown by means of examples that the variation in the first raw moment does not decrease as the order of contact increases with corresponding changes in the order of continuity.

In addition to these results, attention is called to several facts noted in this study. The variation in the moments due to

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grouping in some cases is larger than one would ordinarily suspect. In the development of Sheppard's corrections, it is usually assumed that the main contribution comes from the tails and little from the central portion. Examples are given which show that the shape of the main portion of the frequency distribution can contribute considerably to the variation in the raw moment due to grouping.

The writer conjectures that the raw population moment will, in general, be a better estimate of the true population moment than the raw sample moment. However, this study demonstrates that the raw population moment is not always a good estimate. It is pointed out that the main problem of estimating population moments by raw sample moments is still unsolved.

# GENERATING FUNCTIONS OF JACOBI AND RELATED POLYNOMIALS

(Publication No. 2376)\*

Fred Brafman, Ph. D.  
University of Michigan, 1951

The work of this thesis is intended to be a step in the study of the construction of generating function equations for classical polynomials. One particular method for finding generating functions is emphasized in this paper. If  $\{f_n(x)\}$  denotes the set to be generated, the method is to form

$$(A) \quad \sum_{n=0}^{\infty} c_n f_n(x) t^n,$$

where the  $c_n$  are coefficients involving the index  $n$  and possibly parameters, and then by manipulations on infinite series alone to sum the expression (A) in the spirit of Section 7 of the thesis. The methods used to perform this summation are based on either: (1) finding such a representation of the polynomial set as permits summation indices to be separated by a rearrangement of the order of terms, or (2), finding special relations involving products of hypergeometric functions.

The thesis includes new generating functions as well as exposition of technique. The major results are the following equations, where  $P_n^{(\alpha, \beta)}(x)$ ,  $P_n^{(\alpha, \alpha)}(x)$ ,  $H_n(x)$  denote the Jacobi, ultraspherical and Hermite polynomials, respectively.

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For the Jacobi polynomials,

$$(1) \quad {}_2F_1 \left[ \begin{matrix} a, 1+\alpha+\beta-a; \\ 1+\alpha; \end{matrix} \frac{1-t-\sqrt{1-2xt+t^2}}{2} \right] \cdot {}_2F_1 \left[ \begin{matrix} a, 1+\alpha+\beta-a; \\ 1+\beta; \end{matrix} \frac{1+t-\sqrt{1-2xt+t^2}}{2} \right] \\ = \sum_{n=0}^{\infty} \frac{(a)_n (1+\alpha+\beta-a)_n}{(1+\alpha)_n (1+\beta)_n} P_n(\alpha, \beta)(x) t^n.$$

From equation (1), equations may be obtained for the ultraspherical polynomials by letting  $\beta = \alpha$ , and for the Legendre polynomials by letting  $\beta = \alpha = 0$ .

For ultraspherical polynomials,

$$(2) \quad (1-xt)^{-a} {}_2F_1 \left[ \begin{matrix} \frac{a}{2}, \frac{a+1}{2}; \\ \alpha+1; \end{matrix} \frac{t^2(x^2-1)}{(1-xt)^2} \right] \\ = \sum_{n=0}^{\infty} \frac{(a)_n}{(1+\alpha)_n} P_n(\alpha, \alpha)(x) t^n.$$

A relation on Legendre polynomials may be obtained from (2) by letting  $\alpha = 0$ .

For Hermite polynomials,

$$(3) \quad (1-2xt)^{-a} {}_2F_0 \left[ \begin{matrix} \frac{a}{2}, \frac{a+1}{2}; \\ -; \end{matrix} \frac{-4t^2}{(1-2xt)^2} \right] \\ \approx \sum_{n=0}^{\infty} \frac{(a)_n}{n!} H_n(x) t^n,$$

the generating function on the left being divergent.

In equations (1), (2) and (3), it will be noted that the parameter  $a$  is arbitrary, giving a generating function equation for almost every point in the complex  $a$  plane. It is believed that (1) is entirely new, that (2) is new except for certain special values of the parameter  $a$ , such as  $a = \alpha + 1$ , and  $a = 2\alpha + 1$ , and that (3) is new except for  $a = 1$ .

In addition, this paper presents other results, some of which are believed to be new and others merely new ways of obtaining previously known results.



THIN PLATE PROBLEMS  
INVOLVING BIPOLAR COORDINATES

(Publication No. 2392)\*

Samuel Daniel Conte, Ph. D.  
University of Michigan, 1951

If a thin plate is subjected to an arbitrary load normal to its surface, the plate undergoes a system of stresses and strains which can be expressed in terms of two functions, the normal deflection  $w$  of points originally on the middle plane of the plate, and a stress function  $F$ . For a given plate so loaded the problem is to find a solution of the boundary value problem consisting of the differential equations involving  $w$  and  $F$ , and various boundary conditions.

The cross section of the plate considered in this thesis consists of two circles, one interior to and eccentric to the other. When bipolar coordinates  $(\alpha, \beta)$  are introduced, the biharmonic equation  $\Delta \Delta w = 0$  yields a set of biharmonic harmonic functions involving eight infinite sets of arbitrary constants. The basic equations involving  $w$  and  $F$ , the boundary conditions, and the stresses and strain are expressed in bipolar coordinates. Tensor notation is used to derive these basic relationships.

For the small deflection problem in which the deflection is of higher order than the thickness of the plate, the basic equation is

$$(1) \quad \Delta \Delta w + P(\alpha, \beta) = 0$$

where  $P$  is the load acting normal to the upper surface of the plate. A solution of this equation is sought in the form

$$(2) \quad hw = w_0 + w_1$$

where  $h = \frac{\cosh \alpha + \cos \beta}{c}$  is the stretch factor under the transformation of coordinates,  $w_1/h$  is a particular solution of (1), and  $w_0$  is a set of biharmonic functions. The series of biharmonic functions forms a trigonometric series whose coefficients are hyperbolic functions of  $\alpha$ . If a particular solution of (1) is known, this particular solution is expanded into a Fourier

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series and the boundary conditions are satisfied by proper choice of the arbitrary constants appearing in  $w_0$ .

Two methods are presented for obtaining a particular solution under arbitrary normal loads. In the first method a particular solution is obtained by expanding an arbitrary twice differentiable load function into a series of the eigenfunctions of the system consisting of the equation

$$(3) \quad \Delta u + \frac{k^2}{h^2} u = 0$$

and one of the boundary conditions

$$(4) \quad u = 0$$

$$(5) \quad Au + B \frac{\partial u}{\partial n} = 0.$$

The second method lends itself more readily to numerical computations. It consists of expanding the load function into a Taylor's series in the variables  $x$  and  $y$ . This power series when transformed into bipolar coordinates has the form

$$(6) \quad P(\alpha, \beta) = \sum_{n=0}^{\infty} \sum_{k=0}^n a_{nk} \frac{\sinh^{n-k} \alpha \sin^k \beta}{h^n}$$

Because of the nature of the biharmonic operator in these coordinates, a particular solution of the plate equation (1) is given by

$$(7) \quad w = \sum_{n=0}^{\infty} \sum_{k=0}^n A_{nk} \frac{\sinh^{n-k+2} \alpha \sin^{k+2} \beta}{h^{n+4}}.$$

An explicit expression for  $A_n$  in terms of  $a_n$  is obtained.

A solution of the large deflection problem in which the deflection is of the order of the thickness of the plate is also given. In this case the equations involve both the deflection  $w$  and the stress function  $F$ . The method involves the use of both series of biharmonic functions and series of the eigenfunctions obtained from the system (3) and (4) or (5). This method is not adapted to numerical calculations.

DEFORMATION-FREE CONTINUA IN EUCLIDEAN  $n$ -SPACE

(Publication No. 2393)\*

Morton L. Curtis, Ph. D.  
University of Michigan, 1951

This is a study of continua which separate the  $n$ -dimensional sphere and satisfy some "smoothness" condition given in terms of certain kinds of mappings of the continuum into one of the complementary domains. A principal object is to see what conditions on the complementary domains are implied by the existence of these mappings on the continua. The results are somewhat fragmentary.

A continuum  $M$  separating an  $n$ -sphere  $S^n$  is said to be deformation free into a complementary domain  $A$  if there exists a map  $h: M \times I \rightarrow \bar{A}$  such that  $h(x, 0) = x$  and  $h(x, t) \in A$  for  $t > 0$ . R. L. Wilder proved that in this case there is just one other complementary domain  $B$ , and both  $A$  and  $B$  are  $ulc^n$  (=uniformly locally connected in dimensions  $0, 1, \dots, n$  using homology with a field as coefficient group). This same result is obtained with the  $n$ -sphere replaced by an  $n$ -homotopy manifold  $S$  (=  $n$ -dimensional generalized closed manifold which is locally connected in the homotopy sense in dimensions  $0, 1, \dots, n$ , i.e.  $LC^n$ ) for which  $p^1(S) = 0$ .

It is shown that if  $M$  is an  $LCP^{-1}$  continuum separating  $S^n$  and is deformation free into complementary domain  $A$ , then  $\bar{A}$  is  $LCP$ . If  $M$  is not required to be  $LCP^{-1}$ , but there exists  $\{t_i\} \rightarrow 0$  such that  $h/M \times t_i$  is a homeomorphism for each  $i$ , then  $A$  is  $ULC^1$ . Also if the deformation-free map  $h$  is monotone and open, then  $A$  is  $ULC^1$ . If the deformation-free map is light and open then  $A$  is "almost"  $ULC^1$ . It is shown that the light deformation-free maps form a dense subset of the space of all deformation-free maps.

A convergence of sets in terms of homotopy is defined in a manner similar to the definition by G. T. Whyburn of regular convergence in terms of homology. Application of the theorems proved for this type of convergence yields the theorem: If  $M$  is an  $LC^n$  continuum separating  $S^n$ ,  $A$  is a complementary domain, and for each  $\varepsilon > 0$  there exists a homeomorphism of  $M$  into  $A$  moving each point a distance less than  $\varepsilon$ , then  $A$  is  $ULC^n$ .

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# SOME RESULTS IN LITTLEWOOD'S ALGEBRA OF S-FUNCTIONS

(Publication No. 2397)\*

Donald Gordon Duncan, Ph. D.  
University of Michigan, 1951

With each partition  $(\sigma)$  of an integer  $m$  there is associated a rational integral homogeneous irreducible representation of degree  $m$  of the full linear group, and each such representation is associated with an irreducible representation of the symmetric group of degree  $m$ .

Let  $B=T(A)$  be the above mentioned representation of the full linear group  $GL(n)$  which is defined by the partition  $(\mu)$  of  $m$ . The trace of  $B$  (the character of the representation) is denoted by the S-function  $\{\mu\}$ . Now if  $C=T'(B)$  is the representation of  $B$  of degree  $r$  which is defined by the partition  $(\lambda)$  of  $r$ , then  $C$  is, in general, a reducible representation of  $GL(n)$  of degree  $rm$  and, therefore, the trace of  $C$  is a sum of irreducible characters of  $GL(n)$ . This sum of S-functions is denoted by  $\{\mu\} \otimes \{\lambda\} = \text{trace } C = \sum_{\sigma} k_{\sigma} \{\sigma\}$  and the operation  $\otimes$  is called the "new" multiplication of S-functions. Thus to perform the operation  $\otimes$  one must determine the irreducible constituents of the representation  $C=T'(T(A))$ .

The trace of  $C$  can also be expressed as a polynomial involving the quantities  $t_i(\mu) = \text{trace } B^i$  where  $i=1, 2, \dots, r$  and one method of evaluating  $\{\mu\} \otimes \{\lambda\}$  consists of expressing the  $t_i(\mu)$  as sums of irreducible characters, from which the total quantity  $\{\mu\} \otimes \{\lambda\}$  may be obtained by established methods, namely, the ordinary multiplication of S-functions.

The following results are obtained.

(i) Making use of Nakayama's concept of hooks associated with the Young diagram  $[\sigma]$  which corresponds to an S-function  $\{\sigma\}$ , a short method is obtained for expressing the quantities  $t_n(\mu)$  as sums of S-functions.

(ii) A generating function is developed for computing the case  $\{\mu\} \otimes \{n\}$  (where  $n$  is even). The case  $\{\mu\} \otimes \{n\}$  is of particular importance in the applications of the "new" multiplication of S-functions to invariant theory.

(iii) A method is developed for the rapid computation of the general case  $\{m\} \otimes \{\mu\}$  (where  $(\mu)$  is any partition of

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four). Previously, specific formulas had been obtained by R. M. Thrall for the cases  $\{m\} \otimes \{2\}$ ,  $\{m\} \otimes \{3\}$ .

(iv) The calculations are presented for the products  $\{7\} \otimes \{4\}$ ,  $\{7\} \otimes \{2 \ 1^2\}$ . The cases  $\{5\} \otimes \{4\}$ ,  $\{6\} \otimes \{4\}$  have been computed by other methods recently by H. O. Foulkes.

# ON GROUPS OF ORDER $g=p^2g'$

(Publication No. 2469)\*

Shih-Hua Tsao, Ph. D.  
University of Michigan, 1951

If  $\mathcal{G}$  is a group of order  $g=pg'$ , ( $p$  a prime number,  $(g',p)=1$ ), rather complete results can be obtained by describing the behaviour of the characters with regard to the prime number  $p$ . In this paper, groups of order  $g=p^2g'$ ,  $((p,g')=1)$  are investigated. The situation here is far more complicated, since not only blocks of defects 0 and 1 but also blocks of defect 2 appear about which not much is known in general.

The group  $\mathcal{G}$  contains a group  $\mathcal{P}$  of order  $p^2$ . We have here two cases:  $\mathcal{P}$  may be abelian of type  $(p,p)$  or  $\mathcal{P}$  may be cyclic. We shall restrict our work to the first case. Actually, the methods apply to the second case too, and the situation there is much simpler than in the first case.

We shall consider the normalizers and centralizers of  $\mathcal{P}$  and of the subgroups of order  $p$  of  $\mathcal{P}$ . These groups may be considered as of a less complicated nature than  $\mathcal{G}$ , since we can describe them easily by means of groups whose orders contain the given prime  $p$  only to the first power. The aim of our investigation is to show that the behaviour of the characters of  $\mathcal{G}$  depends strongly on the structure of these subgroups. A number of connections between the characters of  $\mathcal{G}$  and the characters of the subgroups mentioned are obtained.

We begin with a discussion of the centralizer  $\mathcal{L}(\mathcal{P})$  and the normalizer  $\mathcal{N}(\mathcal{P})$ . The group  $\mathcal{L}(\mathcal{P})$  is the direct product  $\mathcal{P} \times \mathcal{M}$  of  $\mathcal{P}$  and a group  $\mathcal{M}$  of an order prime to  $p$ . The factor group  $\mathcal{N}(\mathcal{P})/\mathcal{L}(\mathcal{P})$  is either abelian or a group of well known type. The blocks of defect 2 of  $\mathcal{G}$  are in one-to-one-correspondence with the classes of irreducible characters  $\theta$  of  $\mathcal{M}$  which are associated in  $\mathcal{N}(\mathcal{P})$ . Every block of defect 1 has a defect group

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$\mathcal{P}$ , of order  $p$  which is determined uniquely, if conjugate groups are considered as not essentially different. The centralizer  $\mathcal{L}(\mathcal{P}_i)$  is again a direct product  $\mathcal{P} \times \mathcal{N}$ , and the blocks with the defect group  $\mathcal{P}_i$  are in one-to-one correspondence to the classes of characters of defect zero of  $\mathcal{N}$  associated in the normalizer  $\mathcal{N}(\mathcal{P}_i)$  of  $\mathcal{P}_i$ .

The values of the characters of  $\mathcal{G}$  are described largely by the decomposition numbers  $d_{\mu}^{\lambda}$ . These  $d_{\mu}^{\lambda}$  are elements of a cyclotomic field. In the later sections, the nature of the occurring irrationalities is studied more closely. In particular, we are again interested in the question, to what extent the nature of the irrationalities depends on the structure of the groups  $\mathcal{N}(\mathcal{P})$ ,  $\mathcal{L}(\mathcal{P})$ ,  $\mathcal{N}(\mathcal{P}_i)$  and  $\mathcal{L}(\mathcal{P}_i)$ .

### METAPROJECTIVE GEOMETRY

(Publication No. 2476)\*

Jesse Bowdle Wright, Ph. D.  
University of Michigan, 1951

Metaprojective geometry is the generalization of projective geometry in which the concepts; point, line, . . . , and hyperplane have been abolished. Since points and hyperplanes do not appear in the language of this geometry, the correlations are admitted to its group of transformations. The use of the prefix, meta, implies that the corresponding transformation group is larger than that of projective geometry. These considerations suggest the following problems: to devise a set of axioms which will serve as a basis for the geometry described above, and second, to elaborate the system into a series of definitions, lemmas and theorems.

The set of primitive elements of metaprojective geometry, being analogous to the set of projective points and hyperplanes can be decomposed into two equivalence classes by the binary relation: "having a common incident." In the development of the formal system it is shown that this binary relation must be considered as reflexive, symmetric, and transitive and that it effects a dichotomy of the class of primitive elements of metaprojective geometry. By means of the axioms these two equivalence classes must be related to one another in the same way that points are related to hyperplanes in projective geometry.

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The cases  $n = 2$  and  $n > 2$  differ in some essential points and they are, therefore, treated separately.

Axioms for two-dimensional metaprojective geometry include four from which the properties of the equivalence relation can be deduced and three others which serve to determine the dimensionality of the space. The study of the Pappus and Desargues configurations is natural in this geometry, although no satisfactory formulations of the corresponding axioms have as yet been found.

The first four axioms referred to above also appear as axioms for the  $n$ -dimensional geometry where  $n$  is greater than 2; serving again the purpose of determining the basic structure of the geometry. The ideas of complementary elements, linear independence, and bases are defined and many of the important theorems involving them are demonstrated. One of these theorems states that the dependence or independence of a set of elements does not depend on their order.

The term, flat, is used to denote the analogue of the linear subspace of projective geometry. The class of flats forms a projective geometry as formulated in lattice theory. The theory of flats culminates in a theorem which states that two flats have the same dimension if there is a flat complementary to both of them.

Since metaprojective geometry is the generalization of projective geometry obtained by abolishing the class of points as a uniquely defined entity, it must be possible to recover projective geometry by restoring its individuality to one of the equivalence classes. A set of axioms for  $n$ -dimensional metaprojective geometry may be augmented by an axiom which has the effect of singling out one of the equivalence classes to obtain the  $n$ -dimensional projective geometry.

THE EFFECT OF SYSTEMIC DISEASE ON THE  
PERIODONTIUM OF RHESUS MONKEYS WITH REFERENCE  
TO POLIOMYELITIS, TUBERCULOSIS, AND ALLOXAN  
PRODUCED DIABETES. EXPERIMENTAL PERIODONTAL  
REATTACHMENT IN RHESUS MONKEYS

(Publication No. 2448)\*

Sigurd Peder Ramfjord, Ph. D.  
University of Michigan, 1951

The systemic factors in periodontal disease have been widely discussed in the literature, but mostly on the basis of subjective clinical observations, or on autopsy findings following delayed fixation and without access to control material.

For these experiments 46 Rhesus monkeys were utilized. Nineteen monkeys were inoculated with poliomyelitis and developed a high-grade fever lasting from one to ten days. Color pictures and biopsies were taken before the disease, and the gingiva was examined daily during the disease. The animals were sacrificed when they reached the moribund state, and a necropsy was performed. Dental X-rays were taken and models of the teeth made. Specimens for microscopic study were taken from jaws, teeth, temporo-mandibular joints, mesial end of one tibia, and from viscera, including: lung, peribronchial and mesenteric lymphnodes, stomach, liver, kidney, spleen, adrenals, and pancreas. Hematoxylin and eosin stains were utilized with all of the tissues, and special connective tissue stains were used in some sections of jaws and joints to determine the presence of changes in collagen fibers possibly attributed to acute febrile disease.

Seven healthy monkeys exposed to similar environmental and dietary conditions were used as control animals.

No changes attributable to poliomyelitis were observed in the periodontium. Special connective tissue stains did not reveal any structural changes in the collagenous fibers in joints or periodontal tissues. An association was noted between debris accumulated on the teeth and gingivitis. Gingivitis was observed more frequently and found to be more severe around deciduous than permanent teeth. An inverse relationship was observed between the length of the root of the deciduous teeth and the degree of gingival inflammation.

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Ten monkeys with severe tuberculosis were investigated. The examination described for monkeys with poliomyelitis was utilized for the monkeys with tuberculosis, and the control monkeys were the same in both experiments. Four of the experimental animals had clinically normal gingiva, while the other six showed varying degrees of materia alba, calculus, and mild gingivitis. No periodontal changes were observed that could be attributed to tuberculosis. No collagen change was noted in sections from jaws and joints. The observations did not substantiate the theory of lowered periodontal resistance in tuberculosis.

Ten monkeys were utilized for an experiment with alloxan. A standardized diabetogenic dose of alloxan for Rhesus monkeys was not established. No oral or periodontal changes were observed in monkeys with alloxan diabetes. Toxic effects of alloxan were found in the liver, kidney, and pancreas. The hypoglycemic state which developed following injection of alloxan and the toxic changes seen in the liver appeared to be related. Toxic changes in the kidneys resulted in glomerulonephrosis. The pancreatic changes were comparable to those reported in the literature.

An experiment was performed to investigate the reattachment of inflamed epithelialized periodontal pockets in Rhesus monkeys. Eighteen periodontal pockets in four healthy monkeys were treated for 3-1/2 months. The clinical diminution in the depth of the pocket measured from a fixed point on the tooth was from 0 to 4 mm. Microscopic examination disclosed connective tissue and epithelial reattachment on root surfaces that had been exposed in an inflamed periodontal pocket. Removal of the epithelial lining of the pocket was necessary to obtain reattachment. The degree of inflammation in the area of healing appeared to determine whether the reattachment would be epithelial or connective tissue in type. The least degree of inflammation was associated with connective tissue reattachment. In the presence of marked inflammation little or no reduction of pocket depth occurred.

## METALLURGICAL ENGINEERING

### PRECISE LATTICE PARAMETER DETERMINATIONS OF DIAMOND SILICON AND GERMANIUM BY THE ASYMMETRIC METHOD

(Publication No. 2325)\*

Esrefettin Zeki Aka, Ph. D.  
University of Missouri, 1951

The construction of the apparatus for production of powder patterns at a definite temperature and the technique for evaluation of x-ray powder patterns by the asymmetric method are described in detail, and the mode of error elimination is discussed.

A new scanning device is designed for use in x-ray diffraction work.

A modified method is described for the determination of densities of solids, which eliminates some of the difficulties interfering with other similar methods thus far proposed. Formulae are derived for the calculation of density as well as for reduction of density at a desired temperature.

The following conclusions are drawn from the results of the present investigation:

The minor impurities found in the diamond samples are not dissolved but are included mechanically in the diamond crystals.

The coefficient of expansion of diamond and silicon lattices, as determined by the present experiments, are in agreement with the respective data in the literature. Although there are no data available in the literature concerning the coefficient of expansion of germanium, the value reported here ( $5.93 \times 10^{-6}$ ) is reliable.

The density values of the purest elements, silicon and germanium, deviate considerably from those recorded in the literature.

The crystal lattices of diamond, silicon, and germanium are sound or contain imperfections of the order of magnitude not exceeding the respecting limits of error of the present experiments.

The diamond is more reliable than quartz for use as a standard substance in the x-ray diffraction work.

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The asymmetric method is precise and convenient in its application to accurate determinations of the unit cell dimensions of crystalline materials. The method requires no standard substances and no mathematical corrections for calculation of lattice constants except that for refraction of x-rays.

The densities of purest silicon and germanium should be investigated more thoroughly, preferably using the modified procedure described.

It is further recommended that a study be made of the effects of impurities on the lattice coefficients of expansion of silicon and germanium.

#### THE INFLUENCE OF CHEMICAL COMPOSITION ON THE RUPTURE PROPERTIES AT 1200° F OF WROUGHT Cr-Ni-Co-Fe-Mo-W-Cb ALLOYS

(Publication No. 2451)\*

Edward Evans Reynolds, Ph. D.  
University of Michigan, 1950

The influence of systematic variations of chemical composition on rupture properties at 1200° F was determined for 62 modifications of low-carbon N-155 alloy. These modifications included individual variations of ten elements present in low-carbon N-155 and simultaneous variations of molybdenum, tungsten and columbium. Laboratory induction furnace heats of the alloys were hot forged to round bar stock, solution treated at 2200° F and aged at 1400° F. The melting and fabrication conditions were carefully controlled in order to minimize all variable effects on properties except chemical composition.

For the limited number of composition variables studied, the range in 100-hour rupture strengths was from 26,000 to 52,000 psi. Major strengthening effects resulted from additions of molybdenum, tungsten and columbium, individually or simultaneously. The lowest strength alloy contained none of these elements. Chromium also had a major strengthening influence.

Carbon (varied from 0.08 to 0.6 percent), nitrogen (0.08 to 0.18 percent), manganese (0.3 to 2.6 percent), nickel (11 to 20 percent), cobalt (20 to 33 percent) and columbium (2 to 4 percent) had little influence on rupture properties. Nitrogen (0.004 to 0.08 percent), chromium (10 to 30 percent), nickel (0 to 11

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percent), cobalt (0 to 20 percent), molybdenum (0 to 4 percent), tungsten (0 to 4 percent) and columbium (0 to 1 percent) increased strength appreciably. Silicon (0.5 to 1.6 percent) and nickel (20 to 30 percent) had a weakening influence. Columbium had a marked influence on increasing total elongation to fracture.

Rupture strengths varied directly with a measure of the resistance to creep of the alloys with total elongation to fracture as a parameter. This indicated that rupture strengths were a function of the effect of the composition modifications on both the inherent creep resistance and the amount of deformation the alloys would tolerate before fracture.

Interpretation of the results on the basis of microstructural studies indicated that molybdenum and tungsten improved creep resistance by entering solid solution while nickel and cobalt appeared to improve strength by increasing the solubility of molybdenum and tungsten. Chromium improved creep resistance, at least in part, as a result of an aging reaction. Columbium did not have an appreciable effect on creep resistance but improved rupture strength by increasing the elongation to fracture.

Information is presented which indicates that melting and hot-working conditions play an important role in high-temperature properties of alloys of the type investigated.

## MUSIC

### THE BURGUNDIAN CHANSON (1400-1477): A STUDY IN MUSICAL STYLE

(Publication No. 2367)\*

Walter Leroy Bethel, Ph. D.  
University of Pennsylvania, 1950

The Introduction discusses the approach and the methods used. Transcriptions are assumed to be correct and a contemporary vocabulary will be used throughout. The composers are grouped in three generations and biographical details concerning each are given. In order to show the transformations in

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musical style which took place certain compositions of Machaut and Landini will also be analysed.

Chapter I, The Historical Background, sketches the history of the duchy of Burgundy and mentions contemporary artists, sculptors and writers. Records of the many chroniclers are primary sources of information concerning the use of music.

The French and Italian ars nova traditions are the general state of music in Germany around 1400 are discussed in Chapter II. The Significance of the Literary Texts (Chapter III) lies in the formal structure of the chansons. The content of the chanson text is examined and it is found that the one subject, love, is treated in stereotyped clichés. Although most of the texts are anonymous certain identifiable authors are discussed. Examples, some in English, are given.

The question as to media of performance (Chapter IV) is not simply and categorically answered. After summarizing the various theories (Schering, Riemann, van den Borren, Marix, Hewitt and Hibberd) it is found that each chanson must be examined for interior evidences as to possible media. Important principles include the preponderance of complexity of rhythm, animation, continuous flow, leaps and chromaticism and the nature of a particular instrument. The presence or absence of text is in itself an insufficient criterion for differentiation.

The Melodic Lines (Chapter V) are analysed as to range, both extent and actual pitches, motion characteristics and rhythm. Each voice part is characterized. The influence of the changes from a melody-accompaniment texture through a somewhat homophonic type to a style characterized by equality and sometimes identity of the voice-parts is shown in the resulting transformations of the individual lines.

The Harmonic Structure (Chapter VI) establishes from an analysis of the tonal relationships found initially and finally in the two sections (A and B) of fifteen cacce, fifty ballate of Landini, ten rondeaux of Machaut, 18 chansons by first generation Burgundian composers, 89 chansons of second generation composers and 48 of third generation composers, that a realization of the importance of dominant-tonic relationships became increasingly apparent.

In Chapter VII (Harmony: the Realization of the Triad) certain representative chansons are examined as to the practice regarding the use of full or open triads on the first of the measure. An increased use of full triads is found.

The Harmonic Connections (Chapter VIII) analyses the relationship of roots in chansons of the three generations. It is found that there is an increasing use of roots a fourth or a fifth apart. All the available chansons of Burgundian composers

were examined for their use of sixth-chord style (Faux-bourdon, Chapter IX). It was found that both the first and second generations made extensive use of a cadential formula based on descending parallel sixth-chords. With the increased realization of the full triad and tertian harmony and the importance of dominant-tonic relationships, the third generation is found to use sixth-chord style very rarely. The Cadence (Chapter X) analyses the cadences in the three generations. The shift from complete diatonism to dominant tonic is shown. In order to illustrate the use of non-harmonic tones the first sections of three chansons are given in Chapter XI. The changes in texture are discussed in Chapter XII (Integrative Devices). Contemporary Theorists and Theory (Chapter XIII) shows that theory was no longer traditional but a subject of controversy. Most theorists were concerned with problems of notation. The final chapter (Summary and Conclusions) summarizes the findings and emphasizes the importance of the study of the history of music in the history of the inner life of man.

Lists of chansons with sources and Bibliographies are given in the appendix.

#### FRANCESCO GEMINIANI COMPOSER AND THEORIST

(Publication No. 2363)\*

Marion E. McArtor, Ph. D.  
University of Michigan, 1951

Investigation has shown that existing discussions of Geminiani's work are not only contradictory to each other, but that they are based on insufficient evidence. In order to estimate the significance of his compositions and treatises, their norms and exceptions were determined first in light of his own works, and then in terms of late baroque practices.

The initial procedure was concerned with a highly detailed analysis of texture in the composer's Op. 1 sonatas and Op. 3 concertos. Texture, as used here, comprises all phases of harmonic and formal analysis. Data obtained from these works made it possible to bring into perspective the significant features of the revised editions and of the compositions of the late period. Geminiani's treatises were studied both for their instructive material and for their relationships to his own music.

\* Microfilm copy of complete manuscript of 387 pages, \$4.84. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-107.



The ultimate evaluation of his practice is made through reference to Handel, whose works may be considered as a norm for the period.

Geminiani's early works, which are conservative and traditional in many respects, are notable for their abnormal number of modulations, as well as for the preponderance of simple chord functions. Evolutionary tendencies in his late works are apparent in the increased occurrence of non-harmonic tones, pedal tones, and chromaticism. Larger movement forms are also present, but their size results from juxtaposition and expansion of older concepts rather than from integration.

It is obvious that Geminiani's treatises and revised editions have not received proper attention in studies on ornamentation and phrasing. The treatises, which are primarily instruction manuals, quite naturally over-emphasize their subject matter, and, therefore, they should not be considered representative of Geminiani's actual performance practice. On the other hand, the revised editions, which have been neglected generally, are practical source materials of prime importance.

The general conclusion is that, although Geminiani was not one of the very great composers of his age, a study of his works provides valuable information concerning late baroque music through sources other than the more common ones of Bach, Handel, and Corelli. Whenever additional studies are made of the music of other lesser composers such as Biber, Veracini, and Locatelli, knowledge of late baroque music will be more accurate and complete.

#### THE DODECACHORDON OF HEINRICH GLAREAN

(Publication No. 2424)\*

Clement Albin Miller, Ph. D.  
University of Michigan, 1951

The Dodecachordon of Heinrich Glarean has an important and unique position among the theoretical books of the Renaissance. It is not a theoretical treatise in the usual sense of the word, inasmuch as it includes musical criticisms and analyses, biographical data, valuable anecdotes, and discussions of the musical concepts of antiquity, in addition to presenting a modal theory based on twelve modes.

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\* Microfilm copy of complete manuscript of 871 pages, \$10.89. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-168.



The basis of the present thesis is a first edition of 1547, owned by the Library of the University of Michigan. The thesis contains a critical commentary, a translation of the Latin text, and a transcription of the polyphonic musical examples.

The commentary includes a discussion of the Dodecachordon in relation to modal theory, to contemporary notational and contrapuntal views, and to humanism in music. Although the principal aim of Glarean's treatise is the exposition of the theory of twelve modes, the author did not confine himself to this subject. His erudition is shown in the many references to classical writers, and in the detailed discussions of the use of modes by the ancients. Coupled with great knowledge was a critical faculty which permitted him to discuss and evaluate musicians and musical practices. Thus many of the most significant statements contained in the Dodecachordon are not directly related to modal theory.

A study of the various facets of the Dodecachordon has indicated that its true significance can only be estimated through a consideration of the diverse yet complementary elements which it contains. To neglect or underestimate the relative value of any one part is to do an injustice to the total work. If all the varied aspects of the Dodecachordon are given their proper importance, this book emerges as one of the most valuable treatises of the Renaissance.

#### THE MASSES OF JEAN MOUTON

(Publication No. 2364)\*

Andrew C. Minor, Ph. D.  
University of Michigan, 1951

Jean Mouton, a follower of Josquin, was one of the important sixteenth century composers of sacred music. He was born ca. 1470-1475 probably in Haut-Wignes near Samer in Boulogne. He was maistre des enfans in Amiens and Grenoble and was a member of the royal Chapel of Louis XII and Francis I. He died in St. Quentin, October 30, 1522.

The introductory chapters of the thesis include a biography of Mouton, a short sketch of the development of the ordinary of the Mass before 1500, and a summary of the principal techniques employed in sixteenth century Mass composition.

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\* Microfilm copy of complete manuscript of 755 pages, \$9.44. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-108.

Mouton wrote probably 19 Masses of which 15 are definitely known to exist. He also wrote about 120 motets, six magnificats, and 15 chansons. The present study was based on a transcription and analysis of thirteen Masses. The following Masses are presented for the first time in modern notation: Missa Alleluya; Missa Benedictus Dominus Deus; Missa Dictes moy toutes vos pensees; Missa Ecce quam bonum; Missa Faulte d'argent; Missa Quem dicunt homines; Missa Regina mearum; Missa Sancta trinitas; Missa Sans cadence; Missa Tu es Petrus; Missa Tua est potentia; and Missa Verbum bonum. The Missa Alma Redemptoris, which had already been reprinted by Expert, was also included in style analysis.

Mouton used both secular and sacred cantus firmi and he employed parody technique in two of the Masses. A detailed study was made of these techniques. This study revealed that Mouton followed no set pattern in his cantus firmus treatment, and varied procedures among the different Masses. The subdivision of the text and the modulatory points within the sections of the Mass are indicated in tables.

The matters of cadence practice, rhythm, voice range, polphonic texture of each Mass are presented in detail. In comparison with the vocal music of the later sixteenth century, Mouton's works reveal a greater freedom in the handling of dissonance than was permitted by the later masters.

A list of the printed books and manuscripts of the sixteenth century which included compositions by Mouton is presented in the appendixes together with an alphabetical index of his works. The transcriptions were based on the earliest available sources and deviations from the preferred editions are shown in the section on collation of the sources.

The material presented in this monograph would seem a sufficient basis for the statement that Mouton should at least rank among the very greatest composers of his time. His great eloquence, the beauty of his lines, the great rhythmic freedom and flow of his music clearly entitle him to a distinguished position in Renaissance music.

## THE FANTASIA IN THE WORKS OF JOHN JENKINS

(Publication No. 2365)\*

Robert Austin Warner, Ph. D.  
University of Michigan, 1951

Although John Jenkins (1592-1678) was considered the greatest composer of instrumental music in his age by his English contemporaries, his music was largely forgotten by the time of his death and has received little attention since. It has been the aim of the writer to provide an extensive study of this music in the hope that his efforts will be of some value in the modern re-assessment of Jenkins' place among the chamber music composers of history. The formidable amount of material was restricted to the single fantasias or those occurring with one ayre. One hundred and five of the total 114 works in this form were scored to form a basis of the style analysis.

In the earlier chapters the writer has presented the background for Jenkins' style found in the cultural aspects of the period, the circumstances of his life, and his musical heritage. The actual transcription from the part-books involved problems which are described in Chapter IV. In Chapter V evidence is given to show that certain fantasias attributed to Jenkins are probably spurious and that others are improperly classified. The major part of the study, Chapter VI, has been devoted to an analysis of his style. The musical supplement contains scores of ten fantasias based upon the collation of all known manuscripts available.

The comparison of Jenkins' writing in the various periods reveals important transformations in almost every aspect of his music. The four-, five-, and six-part fantasias for viols (ca. 1625-1640) are largely conservative, preserving the basic technics of the sixteenth century motet-style with instrumental expansions. His writing within these categories can be considered as a summation of the best features of the English chamber music composers of that time. The transition in Jenkins' style is noticeable in the works dated 1654 and decidedly evident in the group for two trebles and a bass written between 1661 and 1666. The final group, the fancies and ayres dated 1674, are progressive and show the application of Jenkins' facile technic in new ways. Distinctive aspects may be found in

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\* Microfilm copy of complete manuscript of 331 pages, \$4.14. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-109.

the use of division technics and the melodic importance of the bass, which is often independent from the keyboard part and performs passages of considerable virtuosity.

Considered as a whole, the fantasias of Jenkins reveal a high level of achievement in the realm of early chamber music and present an individual style not duplicated in abstract continental forms. These art works, long neglected by performers and historians, go far in filling the so-called hiatus in important English art music between the demise of the English madrigal school and the works of Purcell. In the history of the fantasia they form the last great body of the literature and probably should be placed along with Purcell's final contributions as the greatest works in that form.

The writer's experience in the study and performance of these works leads him to believe that many of them could form valuable addition to the present-day chamber music repertory.

## PHARMACOLOGY

### ON THE NATURE OF THE PRESSOR RESPONSE TO ASPHYXIA

(Publication No. 2405)\*

Walter Alfred Freyburger, Jr., Ph. D.  
University of Michigan, 1951

The rise in arterial blood pressure which accompanies a period of asphyxia has been shown to have a complex nature. The most important controlling elements in the response are those of neurogenic nature. Thus, the recent discovery of chemical agencies which block autonomic transmission at ganglion cells as well as those with a so-called "sympatholytic" action permits the use of these drugs in analyzing the nature of the pressor response to asphyxia.

Using arterial blood pressure and arterial blood flow variations as an index of changes in neurogenic vasomotor tone, the response of dogs, cats, rabbits and monkeys to a number of procedures was tested.

1. In dogs and rabbits the blood pressure rise to an asphyxial stimulus or to stimulation of the spinal cord in the

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\* Microfilm copy of complete manuscript of 112 pages, \$1.40. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-149.



thoracic region is not eliminated by the ganglionic blocking agents, tetraethylammonium ion (TEA) or bis-trimethylammonium pentane dibromide (C-5); but it is blocked by the "sympatholytic" drugs di-benzyl- $\beta$ -chloroethyl amine hydrochloride (Dibenamine) and  $\alpha$ -naphthyl-methyl-ethyl- $\beta$ -bromoethylamine hydrobromide (SY-28). In cats and monkeys the pressor response to both of these procedures is eliminated by the ganglionic blocking agents. The effects of atropine and magnesium ion, agents known to possess ganglionic blocking properties, upon the response to asphyxia in the dog are not easy to interpret because of the actions of these substances at sites other than autonomic ganglia.

2. The neurogenic secretion of epinephrine is blocked by tetraethylammonium and complete extirpation of the adrenal glands does not significantly alter the pressor response. Epinephrine, then, does not play an important role in the blood pressure rise which persists after the ganglionic blocking agents.

3. Skeletal muscle activity tending to increase venous return is not an important factor since the response is essentially unchanged by complete curarization.

4. Head perfusion and leg perfusion experiments disclose that the response is neurogenic and is central in origin and/or mediation. The response to asphyxia is not significantly altered by decerebration at the level of the tentorium cerebelli thus indicating a medullary site of action.

5. The pathways not blocked by TEA serve the legs, kidneys and heart and presumably other areas of the body as well.

6. The sympathetic vasoconstrictor fibers course through the ventral roots and not to any significant degree through the dorsal roots.

The results indicate the presence of sympathetic vasoconstrictor pathways either non-ganglionated in nature or possessing ganglion cells of a type not vulnerable to TEA blockade. It is presumed that such pathways serve an emergency function in conditions of severe stress such as those present during asphyxia.



## PHILOSOPHY

### WOODBIDGE, CRITIC OF MODERN PHILOSOPHY

(Publication No. 2344)\*

Patricia Ann Heuser, Ph. D.  
Columbia University, 1950

F. J. E. Woodbridge is primarily a critic of modern philosophy. His writings are almost always directed against some current in philosophical thought. Consequently, it is necessary to understand the criticisms which he makes in their proper contexts before one can get a clear picture of Woodbridge's own metaphysical beliefs.

For this reason, I have attempted to do three things in this dissertation: First, to indicate how Woodbridge was influenced by his predecessors and how he used their beliefs as weapons of criticism for the purpose of transforming analytical metaphysics into a critique of most modern philosophical systems. Secondly, to present and explain the metaphysical theory which Woodbridge himself developed. And thirdly, to evaluate this system, not only as an instrument of criticism, but also as a contribution toward the "scientific" metaphysics which he formulated.

The philosophic naturalism of Woodbridge is firmly based upon the doctrines of Aristotle, Spinoza and Locke. Process, structure and the importance of experience characterize his metaphysics in its barest essentials. One might say that Woodbridge uses the thoughts of these men as tools in the analysis of contemporary problems.

For example, he agrees with Locke that all knowledge comes from sense experience, but he criticizes him for so separating the mental and the physical aspects of existence that most knowledge is entirely uncertain. With Aristotle, he asserts that mind must have a place in the body's world since mind is a function of the body. With mind placed in the context of Nature, we know more than just our own ideas; we know the causes of those ideas — those things in Nature which we are sensing.

Woodbridge also criticizes philosophic idealism. He feels that the greatest error of the idealists was to consider mind as the end term of a relation. It became all important while the

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\* Microfilm copy of complete manuscript of 247 pages, \$3.09. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-88.

other end term — Nature — dwindled into obscurity. With Spinoza, he says that Nature really has an intelligible structure which can be discovered by man. We are living in a world which can be known; it is not a world of appearance with reality ever beyond us as the idealists thought.

Herbert Spencer's monistic theory of evolution is also criticized. According to Woodbridge, Spencer thought that all creation was progressing mechanistically toward a state of perfection. The cause of this progression was evolution. But, says Woodbridge, evolution is never the cause of anything. Rather, evolution is history; it is a process in time and there are many processes, not just one. All these processes exhibit means and ends as well as causes and effects. Teleology and mechanism must go together in a moving world, just as Aristotle thought.

Woodbridge, like Aristotle, defines metaphysics as "the science of being qua being." He feels that the metaphysician, whose subject matter is existence as such, can formulate a theory which will be true of all reality. The method used must be scientific. It is that of analysis and tested generalization. The metaphysician must analyze and describe; he does not explain existence. He starts with a world in which man and Nature are intimately related as polar opposites. Knowledge is possible in a world which has an intelligible structure. Man's problem is not the possibility of knowledge but rather, how best to make use of what he knows in his quest for more knowledge and for happiness.

I feel that Woodbridge, by analyzing and describing things as they are in Nature, by testing the generalizations he makes concerning Nature's most essential characteristics, has succeeded in his attempt to formulate a scientific metaphysics. It is based upon knowledge, not on idle speculation.

THE DOCTRINE OF CONSCIENCE IN CONTEMPORARY  
ANGLO-CATHOLIC THEOLOGY WITH PARTICULAR  
CONSIDERATION OF THE RELATION OF CONSCIENCE  
TO THE THEOLOGICAL DOCTRINES OF HUMAN  
NATURE, SIN, FREEDOM, AND GRACE

(Publication No. 2348)\*

Hanford L. King, Jr., Ph. D.  
Columbia University, 1950

This dissertation points out that the study of conscience is a much neglected area within contemporary Anglican theological thought. Only the Anglo-Catholic segment within Anglicanism has dealt to any great extent with the subject of conscience, and even its moral theologians have conducted their investigations with far too circumscribed an interest, being concerned almost exclusively with the purely rational function of conscience (as conscientia) in determining the rightness or wrongness of particular courses of action. However, this writer is convinced that the study of conscience for casuistical purposes is but one of several important facets in the entire doctrine of conscience, and one of the primary objects of this paper has been to point out some of its neglected theological ramifications. It has been in the sense of conscience (primarily as synteresis) as the capacity within man by which he is aware of moral obligation and moral accountability, and by which he is able to apprehend moral distinctions, that the author has investigated the bearing of the concept of conscience upon the theological doctrines of human nature, sin, freedom, and divine grace.

This paper has attempted to reveal this capacity (synteresis) as a divinely created element rooted in the essence of man's 'total' personal, spiritual nature; that it is a capacity which essentially is 'empty' of any specific moral injunctions and prohibitions, but the particularized acquired content of which is liable to be interpreted in various ways due to the inevitable insinuation of historically contingent factors, and which is also prone to be distorted and perverted through the effects of human sin; that it is a capacity which witnesses to the reality of human freedom, and, when properly 'oriented,' recognizes that liberty is lawlessness without the ultimate authority of a

\* Microfilm copy of complete manuscript of 166 pages, \$2.08. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-92.

personal Savior; that it is a capacity which is not simply divinely created and then "left on its own," so to speak, but is nourished and purified by the redeeming grace of Jesus Christ, and that it is in Him that conscience as total personality discovers the consummation of human freedom; and, finally, that it is not a capacity which is a clear and infallible oracle of God's Will but is in continuous need of spiritual quickening by Divine Grace and of moral education and guidance by human casuistry.

The author devotes his last section to a reconstruction of casuistry which will remove it from the restricted orbit of ratio-legalistic categories and place it in a more comprehensive setting that would make it more sensitive to many of the findings and methods of modern "depth psychology" and be able more effectively to relate man's rational potentialities to his total personality. The rigid adherence by contemporary Anglo-Catholicism to many of the Thomistic principles and practices of Roman Catholic moral theology has subordinated the developing of the total character in positive Christian action to a meticulous concern over how not to sin, and, if one does, how best to satisfy the obligations of penance. The slavish following of Thomistic rationalism by many Anglo-Catholic moralists has resulted in a 'departmentalized' concept of conscience as a purely intellectual function of practical judgment. The proper perspective of conscience as an essential 'ingredient' of man's total being — a fact to which some Anglo-Catholic theologians allude but never develop — is distorted, with a consequent disregard for the relationships which conscience possesses with the other theological doctrines that define man's status as a child of God.

**SPINOZA IN SOVIET PHILOSOPHY. A SERIES OF ESSAYS, SELECTED, TRANSLATED, AND WITH AN INTRODUCTION**

(Publication No. 2484)\*

George Louis Kline, Ph. D.  
Columbia University, 1950

This work consists of translations of seven selected essays on Spinoza by Soviet philosophers, preceded by a long historical and critical Introduction which attempts to clarify the position

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\* Microfilm copy of complete manuscript of 296 pages, \$3.70. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-227.



and influence of Spinoza in Russian thought both before and after 1917. The essays, with the dates of their original publication, are as follows: D. Rakhman, "Spinoza and Judaism," 1923; L. I. Akselrod (Ortodoks), "Spinoza and Materialism," 1925; A. M. Deborin, "Spinoza's World-View," 1927; V. K. Brushlinski, "Spinoza's Substance and Finite Things," 1927; S. Ya. Volfson, "Spinoza's Ethical World-View," 1927; I. P. Razumovski, "Spinoza and the State," 1927; I. K. Luppel, "The Historical Significance of Spinoza's Philosophy," 1932. These essays together total 203 typewritten pages (pica type), and the Introduction another 79 pages — something over 70,000 words in all. An exhaustive (11-page) Bibliography of both Marxist and non-Marxist literature on Spinoza in Russian is appended.

The material presented in the Introduction is the result of a thorough study (which took the author to the Russian shelves of libraries in London, Paris, Vienna, Belgrade, and Ljubljana, as well as New York and Washington) of the Russian Spinoza literature. The Introduction is divided into eight sections: I. A general account of the renaissance of Spinoza scholarship in the Soviet Union during the 1920's and 30's, together with a brief historical survey of the pre-revolutionary Spinoza literature aimed at showing both the continuities with and the sharp divergences from this tradition. II. An analysis of the origin and development of the four schools of Spinoza interpretation among Russian Marxists (Revisionists, Mechanists, Deborinites, and Orthodox Marxists), and their disputes concerning the place and importance of Spinozism as a philosophic system and its relationship to dialectical materialism. III. The Marxist view of the historical setting of Spinoza's philosophical activity, the sources of his philosophy, and its influences on subsequent thought.

The remaining sections consider in detail the various Soviet views regarding specific aspects of Spinoza's philosophy and the extent to which his doctrines have been accepted and assimilated by Russian Marxists. The topics treated include: IV. Spinoza's ontology; the problem of hylozoism, and the concept of "substance." The Spinozistic theory of knowledge, methodology, and cosmology. V. Spinoza and religion. Philosophy and theology. Spinoza's critique of transcendental teleology and his rationalistic approach to the Bible. VI. Spinoza's ethical theory; critique of supernaturalism in ethics. His social and political philosophy.



The concluding sections comprise: VII. A discussion of the general Marxist appraisal of Spinozism. VIII. Critical remarks. This final section examines and criticizes some of the basic doctrines of Soviet Marxism, those in particular which are most closely related to Spinozism. The present study is intended to throw light not only on the philosophy of Spinoza, but to an even greater extent on contemporary Soviet philosophy and Russian thought generally.

All of this material — both the individual essays and the numerous Russian works quoted or summarized in the Introduction — appears here in English for the first time.

### THE IMPACT OF THE THEORY OF RELATIVITY ON SOME RECENT PHILOSOPHIES

(Publication No. 2445)\*

Francis Chester Seaman, Ph. D.  
University of Michigan, 1951

The aim of this essay is to isolate and examine the impact of the theory of relativity on some modern philosophies. The term 'impact' is used in a broad sense. It is meant to denote: first, those doctrines which are to be considered true if the theory of relativity is true; second, those doctrines which follow from certain sets of propositions of which relativity, or some proposition confirmed by relativity, is one of the given set; and third, those doctrines which are implied in an aesthetic sense. Just as certain color schemes are harmonious, while others are not, so the theory of relativity seems to go well with some ideas and seems not to go well with others. In this special sense it seems appropriate to speak of an aesthetic implication. The term 'impact' is a convenient expression for the sum of the above three headings.

The philosophers discussed were chosen arbitrarily. They are: Ernst Cassirer, A. N. Whitehead, Samuel Alexander, and Henri Bergson. In the philosophy of Ernst Cassirer, relativity theory appears as another instance of the general thesis that concepts are free creations; devised for the purpose of making the given of intuition intelligible, and enclosing this given in a fixed framework of concepts.

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\* Microfilm copy of complete manuscript of 204 pages, \$2.55. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-189.

The early writing of A. N. Whitehead begins with the doctrine of the concrete universal as set forth by objective idealism. A separate discussion is given of this doctrine. Even though accepting the concrete universal, Whitehead believes that events can be a principle of individuation. Whitehead regards his use of events rather than just space and/or just time, as confirmed by relativity. Also the use Whitehead makes of relativity in his definitions of certain geometrical concepts is mentioned.

As an approach to the philosophy of Samuel Alexander, the position of Spinoza is first outlined. Then Alexander's outlook is developed in contrast to this scheme. It is shown that for Alexander, the teaching of relativity is that extension has four dimensions. Given this, then Alexander has no trouble in developing a doctrine of finite things which is much more in line with ordinary thought than was Spinoza's doctrine. The new importance given time, together with a doctrine of emergence, transforms Spinoza's doctrine of an infinite number of attributes into a doctrine of a number of levels of emergents.

Henri Bergson's philosophy was developed before relativity. In it there was an elegant symmetry between the self and the universe; a symmetry which was one recommendation of his scheme. But relativity theory with its alternative time systems disrupted this symmetry. Bergson never adequately reworked his system.

Whitehead's later philosophy, as expressed in Process and Reality, envisions the universe as composed of atomic actualities in process. Whitehead argues that relativity confirms that the real is atomic rather than one large continuous process. This provides a cue as to the resolution of Bergson's difficulty. By putting his 'vital' inside events, both the self and the universe can be conceived as growing by finite increments. Thus, through Whitehead, a resolution of Bergson's problem is achieved.

THE TRADITION OF HOBBS  
IN EIGHTEENTH-CENTURY FRANCE

(Publication No. 2489)\*

Leland James Thielemann, Ph. D.  
Columbia University, 1950

The political and ethical philosophy of Thomas Hobbes was known in France from the time the first Latin edition of De Cive was published in Paris in 1642. Eighteenth-century opinion of Hobbes was strongly influenced by the works of English and continental critics whom the French philosophers read both more carefully and more sympathetically than they read Hobbes. The doctrines of natural rights and natural sociability, popularized by Locke and Shaftesbury in their opposition to Hobbes, constituted the central tenets of early French political liberalism. In the field of ethics the classical arguments for immutable morality, revived in England by the Cambridge Platonists in their quarrel with Hobbes, came to France not only through Locke and Shaftesbury, but through Grotius, Clarke, Cumberland and Pufendorf as well, whose works were read widely in French translations.

Summaries of Hobbesian doctrine were included in various eighteenth-century philosophic dictionaries, histories of philosophy and treatises on government, and passing references to it in the literary journals were numerous. With few exceptions the judgments expressed were unfavorable. When the Bibliothèque raisonnée presented a more charitable view of Hobbes in its review of Cumberland, the journal was accused, along with the philosophic movement in general, of being dominated by Hobbesian ideas.

Although Montesquieu criticized Hobbes both in the Lettres persanes and in the Esprit des lois, Catholic reviewers, who saw impiety in certain of Montesquieu's doctrines, accused him nevertheless of being a Hobbist. Clerical writers throughout the eighteenth century continued to see in Hobbes the principal intellectual ancestor of French deism and anti-clericalism. The disrepute in which Hobbesian philosophy stood was even more clearly exposed in the abbé de Prades affaire, during the course of which Hobbism was represented as a philosophy of unlimited natural right and a plea for revolution.

\* Microfilm copy of complete manuscript of 382 pages, \$4.78. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-232.

Diderot's knowledge of Hobbes appears to have been derived mainly from Brucker, whose Latin history of philosophy provided the basis for the article on Hobbes in the Encyclopédie. Diderot's social, ethical, aesthetic and materialist doctrines reveal clear indications of his respect for and his debt to Hobbes. He believed however that Hobbes had exaggerated the wickedness of human nature, and he opposed resolutely Hobbes' political theory.

Voltaire's admiration for Hobbes was largely confined to Hobbes' anti-clericalism. Like Diderot he believed Hobbes' picture of the human condition overdrawn, and he held that the allegation of man's wickedness had served as an apologia for tyranny. Voltaire's own satire of optimism nevertheless had much in common with Hobbesian realism. In orthodox eyes, despite his defense of Natural Law, Voltaire's rejection of the doctrine of innate ideas qualified him sufficiently for the title of Hobbist philosopher.

Rousseau's opposition to Hobbes in the two discourses sprang not from any real difference of opinion concerning the nature of civilized man but from a difference of definition of the state of nature. In the Social Contract he attacked Hobbes' conception of contract and his defense of monarchy, but he followed Hobbes in his rejection of the doctrine of Natural Law and in his principles of the civil religion.

Among the French philosophers studied in this essay only Diderot and, indirectly, Voltaire appear to have been influenced by Hobbes' aesthetic doctrine, and Diderot alone by Hobbes' materialism. Hobbes' contractual theory of justice, opposed by the long tradition of both Platonic and religious absolutism, was partially reflected in Diderot's and Rousseau's formulations of the principles of the secular democratic state. While Hobbes had no systematic followers among the foremost philosophers of the French Enlightenment, he played a conspicuous part in tempering both the individualistic doctrine of natural rights and the optimistic faith in natural sociability.



FREDERICK AUGUSTUS RAUCH  
AMERICAN HEGELIAN

(Publication No. 2362)\*

Howard J. B. Ziegler, Ph. D.  
Columbia University, 1950

Frederick Augustus Rauch was born at Krichbracht, Electoral Hesse, Germany, on July 22, 1806. At the age of 17, he entered the University of Giessen where his major interest was the study of philology. In 1826 he became a teaching assistant at the Hadermann Institute at Frankfort-on-the-Main.

In the following year the faculty of philosophy at the University of Marburg accepted Rauch's philological treatise, In Sophoclis Electram Observationes, and conferred upon him the Doctor of Philosophy degree, March 6, 1827.

In December of the same year he went to Heidelberg and there continued his studies in philology. While there he may have come into contact with Carl Daub, the Hegelian professor of theology, who seems to have been instrumental in inspiring Rauch's enthusiasm for Hegel. In Rauch's dedication of his first post-doctoral treatise, Die Identität der Hindu, Perser, Pelasger, Germanen, und Slaven, dargethan aus Sprache, Religion und Sitte (Marburg 1829), he acknowledges Daub.

Rauch's Vorlesungen über Göthe's Faust (Büdingen 1830) contains his metaphysical doctrine. The pattern is in the universal categories of Hegel's logic, as in dialectical succession they consummate the realization of Absolute Idea.

In November 1828, Rauch returned to Giessen where he subsequently joined a seminar under Osann and where he was provisionally habilitated. He was officially habilitated on April 28, 1830. Meanwhile he had become involved in a personal controversy with Osann, the final issue of which was never determined by the Ministry of Justice of Great Hesse to which appeal had been made.

The unresolved controversy served only to jeopardize Rauch's position at Giessen and to make it advisable for him to resume his career elsewhere. He subsequently journeyed to America, arriving in New York in November, 1831.

A few months later he became one of the two first professors of Lafayette College.

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By the fall of 1832 he had removed to York, Pennsylvania. He was ordained to the ministry of the German Reformed Church, and was installed as the first principal of its Classical School and the professor of Biblical Literature in its Theological Seminary.

After the Classical School was relocated in Mercersburg, Pennsylvania, and was chartered as Marshall College in 1836 [United with Franklin College, Lancaster, 1853], Rauch became its first President. The first edition of his final and most significant publication, Psychology, or a View of the Human Soul; including Anthropology, (New York 1840), appeared approximately a year before his death, which occurred March 2, 1841. (Second edition, 1841; and reprints 1841, 1844, 1846, 1850.) This work epitomizes the character of all his writings in America. It is the complete tracing, and the introduction (in English) to America, of Hegel's philosophy of mind.

Accordingly, Rauch's mental philosophy emphasizes the dialectical tracing of the development of self-conscious free mind from the individuated anima mundi. This philosophy of mind is not confined to the study of subjective mind, however, but, as a comprehensive systematic whole, embraces likewise the development of objective mind in abstract right, morality, and social ethics, and goes on to the dialectical grasp of absolute mind in art, religion, and climactically, in philosophy.

This account of Rauch's life and thought is based on records of the Universities of Heidelberg, Marburg, and Giessen and upon the records of the civil courts of Giessen and Darmstadt, and upon the study of the authorship of several manuscript volumes left by Rauch and now in the archives of Franklin and Marshall College. The chief problem to be solved was the extent of his indebtedness to Daub and of his discipleship of Hegel.

## PHYSICS

### BETA RAY SPECTRA OF THE FORBIDDEN TRANSITIONS OF $C^{14}$ , $Y^{91}$ , $Cl^{36}$ , $Be^{10}$ , AND $K^{40}$

(Publication No. 2341)\*

Lawrence Feldman, Ph. D.  
Columbia University, 1950

This paper reports the results of beta ray spectrum measurements of the forbidden transitions of  $C^{14}$ ,  $Y^{91}$ ,  $Cl^{36}$ ,  $Be^{10}$ , and  $K^{40}$ . Included are a resume of the Fermi theory of beta decay with its extension to forbidden transitions as given by Konopinski and Uhlenbeck, a discussion of the theory, design and tests of a ring-focus baffle system for the solenoid spectrometer, and a description of a low background Geiger-Mueller counting system.

All the spectra investigated, with the exception of  $C^{14}$ , exhibit forbidden spectrum shapes, i. e. non-linear Kurie plots. An explanation is offered to reconcile the allowed spectrum of  $C^{14}$  with its empirical classification as second forbidden. The  $Y^{91}$  spectrum can be accounted for by the first forbidden axial vector or tensor interactions, characteristic of a transition for which  $\Delta J = 2$  (yes). The spin changes involved in the beta decay of  $Cl^{36}$ ,  $Be^{10}$ , and  $K^{40}$  are respectively 2, 3, and 4. They exhibit similar spectrum shapes although the decays correspond to different degrees of forbiddenness. A comparison of the theoretical half-lives with the observed values for  $Be^{10}$  and  $K^{40}$ , together with their known spin changes, leads to a prediction of a unique spectrum shape in each case. These have been observed experimentally. The spectrum shape can be accounted for by the tensor and axial vector interactions if the spin change is one greater than the degree of forbiddenness and by the tensor and polar vector interactions if the spin change and degree of forbiddenness are the same. No single interaction can account for the spin change and spectrum shape of  $Cl^{36}$ . The linear combinations which give good agreement consist of G-T (axial vector or tensor) and Fermi (scalar or polar vector) terms. These combinations are also valid when the spin change is one greater than the degree of forbiddenness and the spectrum shape is explained by the G-T interactions. In this case the Fermi terms vanish identically. It seems that part of the true interaction governing beta decay must contain G-T terms.

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The general validity of the linear combinations used for C136 requires further verification.

APPLICATION OF GEIGER-MÜLLER COUNTERS  
AND ELECTRON MULTIPLIER TUBES  
TO MEASUREMENT OF HIGH TEMPERATURES

(Publication No. 2414)\*

John Charles Johnson, Ph. D.  
University of Michigan, 1950

Two methods of color temperature measurements have been investigated, one of which has been satisfactorily applied to the control of creep testing furnace temperatures. Both of these methods are based on the measurement of spectral radiancy from a high temperature body. One method makes use of the change in radiancy of a body within a single spectral region with corresponding changes in temperature, while the other makes use of the change in the ratio of the radiances at two different spectral regions with their corresponding temperature changes. These investigations have led to the design and construction of two instruments for the control of furnace temperatures within .05 per cent in the range from 700°C to 1900°C. There is no theoretical upper limit to the temperature range which can be measured by this apparatus.

For measuring the radiancy within a single spectral region, two types of detectors have been utilized, namely, Geiger-Müller counters and Type 1P28 photomultiplier tubes. The G-M counters were used for indication and control of temperatures from 1400°C to 1900°C and the photomultiplier detectors were used for the 700°C to 1400°C range.

Absolute temperatures are not obtainable with the single spectral radiancy method, consequently, calibration for each particular set-up was made by use of a Leeds and Northrup optical pyrometer. The best limit of control with the G-M detector applied to an induction furnace was  $\pm 1^\circ\text{C}$  at 1900°C while even smaller changes of temperature could be detected. The best limit of control obtained for the phototube detector applied to a platinum-wound furnace was  $\pm 1^\circ\text{C}$  at 1400°C.

Type 1P28 photomultipliers were used as detectors for the two spectral region method. Filters were used to isolate the

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\* Microfilm copy of complete manuscript of 106 pages, \$1.33. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-158.

two spectral regions. The ratio of the signals from the phototubes was measured directly by a Leeds and Northrup ratio recorder. The accuracy obtained was  $\pm 10^\circ\text{C}$  at  $1260^\circ\text{C}$ .

AN INVESTIGATION OF THE PROTONS PRODUCED  
BY THE ALPHA PARTICLE BOMBARDMENT OF BORON

(Publication No. 2406)\*

Glenn McKinley Frye, Jr., Ph. D.  
University of Michigan, 1951

Previous work on the protons emitted when boron is bombarded by alpha particles had indicated several energy groups. In this experiment the protons were observed in a semi-circular focusing magnetic spectrograph making an accurate energy determination possible. The proton line shape to be expected is investigated. The protons were observed at both  $0^\circ$  and  $90^\circ$  to the alpha beam.

Polonium alpha particle sources with strengths of 38 and 25 mc. were used. The targets were either foils made of pressed boron powder or boron oxide evaporated onto tin with a minimum thickness of 0.87 cm of air. One target was made with enriched  $\text{B}^{10}$  (96%). Nuclear track plates were used as the detector. Their characteristics as applied here are discussed in some detail. Exposures of 100 hrs. under a magnetic field of 16,000 gauss were necessary. The proton energy was measured relative to the 5.300 Mev. polonium alpha line.

Q values were found of 3.79,  $0.75 \pm 0.1$ ,  $0.24 \pm 0.02$ , and  $-0.22$  Mev. The first is uncertain due to its very low intensity. The  $-0.22$  group was partially screened by the one with  $Q = 0.24$  Mev. The  $\text{B}^{10}$  target identified the second group as belonging to  $\text{B}^{11}$ , all the other to  $\text{B}^{10}$ .

The present status of the proton spectrum is discussed. Further experiments on ( $\alpha$ , p) reactions and other investigations using this apparatus are proposed.

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CONFORMAL MAPPING AND A PERTURBATION  
METHOD IN THE STUDY OF CONICAL FLOWS

(Publication No. 2422)\*

James Alfred McFadden, Ph. D.  
University of Michigan, 1951

In the linearized theory of supersonic flow, a perturbation method is developed by which the boundary condition on the surface of a conical body can be approximated to any given order in the angles of attack and yaw.

A conical flow is assumed, and the problem is reduced to one in the complex plane by means of a hyperbolic stereographic projection, after the method of Laporte and Bartels.<sup>1</sup> Angles of attack and yaw are described by non-Euclidean rotations in the flow space, which preserve both the linearized equations of flow and the Mach cone of supersonic disturbance, and similar transformations in the velocity components are employed so that the equations of irrotationality are also preserved. The image of the disturbed flow space in the complex plane is mapped conformally into a canonical region, where the flow problem can be solved.

In particular, mapping functions are derived for domains bounded by a cross and the unit circle.

The perturbation method begins with a series development of the non-Euclidean transformations of coordinates and velocity components and of the boundary conditions in powers of the angles of attack and yaw. The problem is then solved for successive powers of the angles. This method is tested by applications to the problems of the delta wing and of the circular cone, both of which have been solved previously by other methods. In each case the solutions compare favorably.

The final application of the perturbation method is to the cruciform delta wing. In a second-order calculation, all terms but the second-order interaction can be obtained by superposition of solutions of two simple delta wings. The interaction problem is considered in a rectangular region obtained by conformal mapping, and a numerical method using Fourier series is suggested. It can be seen from the boundary conditions that this interaction does not contribute to the forces on the wing and that the contribution to moments is extremely small.

\* Microfilm copy of complete manuscript of 102 pages, \$1.28. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-166.

<sup>1</sup> Bumblebee Report No. 75 (1948).



PROPERTIES OF COSMIC RAYS  
UNDER 1100 FT. OF EARTH

(Publication No. 2449)\*

Charles Addison Randall, Jr., Ph. D.  
University of Michigan, 1951

This is a study of the cosmic radiation observed underground in a salt mine at a depth of 860 mwe below the top of the atmosphere. It is concerned primarily with the nature of the secondary radiation and its relation to the penetrating radiation which carries the cosmic ray energy underground.

The measurements were made with twenty Geiger-Muller counters arranged variously in two trays and in three trays. Coincidences between the trays were measured with Rossi circuits of short resolving time; the data were recorded by mechanical registers. Electronic regulation of the power supply and constant monitoring of the equipment insured reliable operation over the long time intervals required by the low counting rates.

The absolute vertical intensity and the distribution of intensity as a function of zenith angle were measured for both the meson component and for the secondary radiation. The latter was corrected for the locally produced  $\gamma$ -rays from the radioactive constituents of the earth material and salt surrounding the mine cavity. The angular separation of the secondaries of the mesons was measured. Absorption curves of the secondaries were obtained using both lead and carbon absorbers. The ratio of the intensity of the secondary radiation to the penetrating component was measured. The effect of 27 cm of lead absorber upon the penetrating component was small and was essentially the same as the decrease in intensity in the same number of  $\text{gm cm}^{-2}$  of earth.

The penetrating component is consistent with the hypothesis that it is  $\mu$  mesons coming from sea level and/or above. The secondary radiation consists of relatively low energy ( $\sim 30$  mev) electrons. The number of secondary electrons relative to the mesons is consistent with the assumption that they are produced from mesons of spin  $1/2$  by knock-on processes and by radiation of the meson in the Coulomb field of nuclei in salt.

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\* Microfilm copy of complete manuscript of 124 pages, \$1.55. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-193.

# THE MEASUREMENT OF THE BETA SPECTRA AND THE INTERNAL CONVERSION ELECTRONS OF VARIOUS ISOTOPES

(Publication No. 2456)\*

Ernest W. Salmi, Ph. D.  
University of Michigan, 1951

The purpose of this investigation was to measure the shapes of various beta spectra and to compare the data with the theory of beta decay. The order of forbiddenness of the beta transitions was established, when possible. By studying the internal conversion electrons, several decay schemes were proposed. The actual measurements were made with a double focusing beta ray spectrometer. The results of the measurements are summarized below.

Terbium 160 (73 days): The internal conversion electrons indicated six gamma rays. The beta spectrum was split into two allowed beta spectra with end points of 886 and 546 Kev. A level scheme was proposed.

Hafnium 181 (55 days): Aside from the four previously reported gamma rays, a 613 Kev. gamma ray was also found, which fitted into the decay scheme proposed earlier. There was only one beta spectrum.

Lutecium 177 (7 days): Two gamma rays of 208 and 113 Kev. were found. The beta spectrum was separated into two, or possibly three, parts with end points of 504 and 390 Kev.

Tantalum 182 (117 days): The conversion lines indicated there were eleven gamma rays with energies less than 300 Kev. The beta spectrum was found to be composed of two beta spectra with end points of 515 and 374 Kev. The high energy beta spectrum appeared to have an allowed shape.

Scandium 46 (85 days): The low energy beta spectrum had an end point of 360 Kev. The Fermi plot was not straight. A high energy beta spectrum was also found.

Iodine 131 (8 days): By studying the conversion electrons, four gamma rays were found. The Fermi plot of the beta spectrum indicated two end points; however, the low energy end point could not be established very accurately.

Sulphur 35 (87 days): This beta spectrum, in particular, was studied as a check on the theory of beta decay. The beta ray spectrum was found to be allowed with a straight Fermi plot down to at least 40 Kev.

\* Microfilm copy of complete manuscript of 104 pages, \$1.30. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-199.

Cesium 137 (33 years): The metastable state following beta emission was found to have a half-life of 154 seconds. The K internal conversion coefficient of the lone gamma ray checked with the theoretical value for a magnetic  $2^4$  pole transition. The Fermi plot of the low energy beta spectrum was straightened out by the first forbidden  $+2$  spin change correction factor. It was also shown that the high energy spectrum could be second forbidden with  $+2$  spin change.

In conclusion, one may say that the current theory of beta decay seems to be very well confirmed by the data obtained in this investigation of  $S^{35}$  and  $Cs^{137}$ , where the spins are known both before and after the beta transitions. In the case of  $Cs^{137}$ , the experimental K internal conversion coefficient was in agreement with the theoretical value calculated by Rose. For the more complex spectra of the other isotopes studied, various energy level diagrams were proposed; however, one should have data on various types of coincidence measurements to confirm these level schemes.

#### A STUDY OF THE THERMIONIC EMISSION, PHOTOELECTRIC EMISSION, AND THE ELECTRICAL CONDUCTIVITY OF BARIUM OXIDE

(Publication No. 2332)\*

Irvin Lee Sparks, Ph. D.  
University of Missouri, 1951

A study of the thermionic emission, photoelectric emission, and electrical conductivity of barium oxide coated cathodes has been made.

A new retarding potential method was used to study the conductivity of the oxide coating. This method involved measuring the voltage drop across the coating as thermionic emission was drawn from the cathode. In the case of barium oxide, it was found that the method was useful only on certain cathodes in which the thermionic emission was high compared to the specific conductivity. The method should be quite useful in the study of  $(BaSr)O$  coated cathodes since the emission is normally higher than that observed for  $BaO$  while the conductivity is approximately the same.

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Thermionic emission measurements were made over twelve orders of magnitude in the case of one cathode. By assuming the  $A$  constant in Richardson's equation equal to the theoretical value, a temperature dependence of the work function was found. The temperature dependence found here was the same as that calculated from Huber's data on the contact potential difference method of determining the work function for  $(\text{BaSr})\text{O}$  coatings.

Photoelectric studies indicated that any agreement between the photoelectric yield for  $\text{BaO}$  and that predicted by Fowler's theory for metals was entirely fortuitous. An enhanced photoelectric emission caused by irradiation with light in the 3000 to 4000 Å range was observed.

The results of this investigation indicate that the simple energy level diagram frequently used to describe the energy levels of an oxide coated cathode should be revised considerably. This is especially necessary in order to explain the photoemission results.

#### THE PHENOMENOLOGICAL NEUTRAL VECTOR MESON FIELD

(Publication No. 2471)\*

Walter Wataru Wada, Ph. D.  
University of Michigan, 1951

Assuming that the mesons are responsible for nuclear forces an attempt is made to generalize the neutral Proca equations to establish the phenomenological neutral vector meson field equations for nuclear matter in analogy to the phenomenological electromagnetic equations.

Being guided by the principle of relativistic invariance the phenomenological neutral Proca equations are first postulated in analogy to the established way of generalizing the microscopic electromagnetic equations to the phenomenological field. These equations are later derived from the microscopic equations by means of averaging the microscopic physical quantities which characterize the process of scattering of the field by the nucleons. It is found that the only non-vanishing phenomenological constants of the nuclear matter are those analogous to  $\epsilon$  and  $\mu$  in the Maxwell theory.

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Next, the material constant  $\epsilon$  is derived in the vector coupling by solving the classical equation of motion of a nucleon in the external mesonic electric field. It is found that  $\epsilon$  is very nearly equal to unity. The other material constant  $\mu$  is derived in the tensor coupling by solving the classical equation of motion of the spin of a nucleon in the external mesonic magnetic field. Assuming that the comparatively smaller number of nucleons in the volume of cube of a wave length would still give rise to completely coherent scattering of the meson waves, the real and imaginary parts of  $\mu$  up to about 340 Mev are both about 1.5 for the nuclear matter.

As an application of the phenomenological Proca field the analog of the electromagnetic Čerenkov radiation is investigated, i. e., if the phase velocity of propagation of the meson waves is less than the velocity of an extremely high energy nucleon which is penetrating through a heavy nucleus, a constructive interference of waves may occur along a cone emanating from the penetrating nucleon and moving along with it. The expression of energy emitted in the form of the meson waves per unit length of the path of the nucleon is given. The multiplicity of mesons of energies lying in the range 200-340 Mev created by a heavy nucleus is of the order of three when the nuclear fine structure constant  $f^{1/2}_e$  for the tensor coupling is taken to be 0.3.

The theoretical considerations developed in this investigation seem to indicate that it is possible to ascribe a phenomenological meson field to the nuclear matter in the region of low meson energy. However, the fact that the number of scattering centers in the volume of a cube of the wave length is small compared to that in the low energy region of the electromagnetic field appears to imply that the coherent scattering may not be as complete as in the case of the electromagnetic theory. This means that the actual mesonic nuclear material constant  $\mu$  may not differ appreciably from unity, and consequently the entire theory may be pertaining to a small physical phenomenon, if it exists at all. Whether or not it is small or just how small it is, is a question which is beyond the scope of the present investigation.



INTESTINAL MOTILITY AND INTESTINAL BLOOD  
CIRCULATION

(Publication No. 2436)\*

Mahmoud Sidky Mohamed, Ph.D.  
University of Michigan, 1951

The purpose of this study was to investigate some of the fundamental relationships between the motility of the small intestine and the blood flow through this organ as influenced by alterations in arterial, venous and intraluminary pressures, by pulsatile pressure, by variations in arterial  $\text{CO}_2$ , by arterial low  $\text{O}_2$ , and by acetylcholine. The experiments were carried out on isolated loops of the dog's small intestine perfused with heparinized dog's blood; a few experiments were also performed on loops perfused 'in situ' with their nerve supply intact.

1. During rhythmic activity of the intestine the blood flow was intermittent with the venous outflow increasing, and the arterial inflow decreasing during each contractile phase; these changes were reversed during each relaxation phase. This reciprocal relationship between the blood outflow and inflow constitutes a pumping mechanism which facilitates the movement of blood through the intestinal wall.

2. Intestinal tonic contraction caused a predominant decrease in blood flow, followed by an after-effect of a supranormal flow which is attributed to liberation of vasodilator substances during the high tonus. Such post-tonic supranormal flow led to an increase in the mean flow of blood through the tissue.

3. Increased motor activity of the intestine caused an augmentation of the mean intrinsic blood flow by virtue of increased formation of vasodilator metabolites and by increased propulsive power of the intestinal rhythmic contractions on the blood flow. Such propulsive power was, under certain conditions, capable of pumping the blood against a venous pressure higher than the arterial. This phenomenon must be of considerable significance in the intact animal since it facilitates the movement of blood from the small intestine to the liver against unduly high portal vein pressures.

4. Alterations in both the arterial and venous pressures per se, as well as the attendant changes in the volume flow of blood appreciably influenced the motor activity of the small intestine.

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5. Sudden elevation of the arterial pressure caused vasoconstriction, while sudden lowering caused vasodilatation in the isolated small intestine.

6. Shifting from constant to pulsatile pressure caused: a) a distinct depression of the intestinal motor activity independent of any changes in the blood flow, b) an initial temporary vasoconstriction followed by vasodilatation; occasionally there occurred pure vasodilatation or pure vasoconstriction. Evidence was obtained that atropine 'paralyzes,' at least partly, the vasoconstrictor component of the vascular reaction to pulsatile pressure.

7. Elevation of the intraluminary pressure caused a decrease in the blood flow, and an increase in both tonus and rhythmic activity of the small intestine.

8. In the isolated loop, with nerve supply intact, asphyxia and hypercapnia acting centrally or reflexly caused a vasoconstriction.

9. Hypercapnia in the loop caused a local vasodilatation, and a predominant depression of the motor activity of the gut occasionally preceded by an initial stimulation; acapnia caused a local vasoconstriction.

10. Anoxia induced in the loop by low arterial  $O_2$ , by cyanide and by arterial occlusion caused a local vasodilatation.

11. Anoxia induced by low arterial  $O_2$ , and by occluding or diminishing the arterial supply caused a predominant depression of the intestinal motility and tonus not infrequently preceded by an initial stimulation.

12. Acetylcholine caused a marked vasodilatation and in larger doses also evoked distinct motor reactions in the gut; occasionally the resultant increase in intestinal tonus temporarily masked the vasodilatation induced by this drug or even caused an actual decrease in the blood flow by passive vascular compression.

THE RIGHT TO COUNSEL IN AMERICAN COURTS

(Publication No. 2232)\*

William Merritt Beaney, Jr., Ph.D.  
University of Michigan, 1951

This study, based primarily on over five hundred state and federal cases, attempts to ascertain the meaning and content of the right to counsel in our court procedures. The English and American historical antecedents are reviewed, followed by an intensive study of the federal cases arising under the Sixth Amendment provision. Then the state cases arising under state constitutional and statutory provisions are analyzed in order to exhibit the diversity of state practice which has resulted in many appeals to the United States Supreme Court since 1932 on the ground that state action was contrary to the standard required by the due process clause of the Fourteenth Amendment. The Supreme Court counsel cases are reviewed and analyzed, from Powell v. Alabama to Quicksall v. Michigan in 1950. Relevant articles are cited where appropriate, although the volume of literature on this subject is limited. Observations on the practical aspects of the problems by lawyers and other judicial figures are introduced.

The Sixth Amendment provision has been interpreted broadly to mean the right to appointed counsel, unless competently waived, and a plea of guilty is not a waiver in itself.

The states grant the right in a variety of forms. Few have interpreted their constitutional provisions broadly. All require appointment in capital cases for defendants who are without counsel, but in non-capital cases over a fourth have no provision for counsel even upon request by the accused. Difficulties have arisen because of the absence of a statute placing on judges a duty to advise defendants of their right to counsel.

Following Powell v. Alabama in 1932, a decision which seemingly required appointment for certain defendants in capital cases, the case of Betts v. Brady in 1941 appeared to grant great discretion to the states in the non-capital cases. A "fair trial" rule was evolved in this case, under which the state court's failure to appoint was examined under a vague and changing body of standards which was clearly revealed only to the majority of Justices in each case. A minority of the Court sought to extend the Powell rule to non-capital cases, if unsuccessful in "incorporating" this and other

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rights of the Bill of Rights into the due process clause of the Fourteenth Amendment.

Because of the vagueness of the rules which the Supreme Court has announced, the precise meaning of the "right to counsel" in state non-capital cases is not yet clear. The amount of litigation shows no sign of abatement, and some of the states have already taken action in order to remedy an unsatisfactory element in our judicial procedure.

**THE FOREIGN POLICY OF GUSTAV STRESEMAN WITH  
RESPECT TO THE TREATY OF VERSAILLES  
A STUDY IN PACIFIC REVISIONISM**

(Publication No. 2377)\*

Henry L. Bretton, Ph.D.  
University of Michigan, 1951

This is a study in international relations. It seeks to discover the political and diplomatic means applied by the German Foreign Minister between 1923 and 1929 in his attempt to weaken the Treaty of Versailles. The specific international problem to which this study addresses itself is the policy of pacific treaty revisionism, and whether or not Stresemann followed a consistent pattern in the execution of that policy.

In order to discover whether Stresemann had certain basic and preconceived ideas on treaty revision before he became Foreign Minister, the study first analyzes the revisionist content of his earlier writings and pronouncements. Next, an attempt is made to ascertain to what extent he preferred to use certain standard political and diplomatic methods. Following this, his foreign policy and conduct of national political affairs are examined and analyzed for their revisionist content in relation to the several major aspects of the peace settlement. These major fields of inquiry are:

1. The war guilt question.
2. The penal clauses of the Treaty of Versailles and the application of sanctions.
3. The question of the detached areas.
4. The question of German minorities abroad.
5. The question of the disarmament and demilitarization of Germany.

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The results indicate that there was a direct relationship between Stresemann's earlier concepts of Germany's international position and his subsequent foreign policy, and that his diplomatic and political methods applied themselves singularly to a policy of revisionism. He pursued a distinct pattern of pacific revisionism with full regard to the adverse circumstances in which Germany found herself as a defeated country. The actual modifications of the peace settlement achieved by Stresemann were fundamental rather than quantitative in nature. They lent themselves to future specific changes in the treaty structure.

The general conclusion is that Stresemann undermined the treaty structure gradually and in a piecemeal fashion. He accomplished this first by repudiating the hypothesis of war guilt and responsibility. Next, he weakened the Treaty by rendering its penal clauses ineffective. The way was prepared for territorial revision by the encouragement of irredentism. Finally, transferring certain disputes from the sphere of treaty relationships to that of international organization, he enlarged the scope of his foreign policy and created a different frame of reference for it. To give his policy the desired effect, in an international order based upon armament, he successfully strove to remove all effective controls over Germany's military potential. In the way of a general characterization of Stresemann's revisionism, it can be said with reasonable certainty that his objectives were limited in scope, that they were bare of all reference to the application of force, and that they were advanced primarily to alleviate certain hardships and domestic problems created by the Treaty rather than for the purposes of facilitating expansion and as designs for aggression.

#### THE GERMAN REICHSTAG ELECTIONS OF SEPTEMBER 1930

(Publication No. 2483)\*

Louis Hallgring, Jr., Ph.D.  
Columbia University, 1950

In the years from 1919 to 1930, the German people had been handicapped in their efforts to operate a new democratic government by both political and economic disadvantages. To these was added in 1930 the threat of an extensive economic dislocation at

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\* Microfilm copy of complete manuscript of 279 pages, \$3.49. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-226.



home. The threatened economic crisis which accompanied the world depression of 1929 accentuated still further the basic ideological cleavages characteristic of the German party system.

By March, 1930, the Great Coalition government of Hermann Müller was experiencing internal differences of an ideological nature. These differences largely accounted for the failure of the government to reach agreement on essential financial legislation, despite its success in securing parliamentary acceptance of the Young Plan. Unable to compromise the differences of the two extremes in his cabinet, the German People's Party and the Social Democrats, Müller submitted his resignation on March 27.

President von Hindenburg thereupon commissioned Heinrich Brüning, a Centrist, to form a new government. The decision of the president to authorize the formation of an essentially conservative ministry had been expected. It was no surprise, therefore, when on April 1, Brüning presented a minority government composed of representatives of the moderate parties and a few German Nationalists dissatisfied with the leadership of Alfred Hugenberg. To make up for its lack of strength in the Reichstag, von Hindenburg gave the new cabinet full power to use the emergency powers of Article 48 of the Weimar Constitution and the right to dissolve the parliament.

Despite the insecurity of his position, Brüning was able to secure parliamentary approval of a preliminary financial reform in mid-April. However, when he began the task of framing the budgetary legislation, he met the firm opposition of the Social Democrats and the German Nationalists. These two parties, together with the extremes of Right and Left, had sufficient strength to defeat Brüning's budget and to request withdrawal of an emergency decree of July embodying the budget, finance reform, and agrarian aid. This twofold defeat led Brüning to dissolve the Reichstag on July 18.

The Reichstag dissolution began an election campaign which lasted until the voting on September 14. During the campaign, the Democrats, the People's Party, and certain conservative groups began negotiations designed to result in the formation of new political parties. These negotiations were successful only in part, and, as the election results were to show, did not succeed in winning additional strength for moderate parties which loyally supported the Weimar system.

In addition to these fruitless attempts to bolster the strength of moderate parties, other characteristics of the campaign were the apparent self-assurance of the Socialists, the inaction of the Center, and the fanaticism of the Communists and National Socialists. The latter were especially vocal with bitter denunciations of the Republic, its leadership, and its policy. They exploited

nationalistic feelings and economic discontent to win support for their avowed policy of bringing an end to the Weimar Republic.

The election results proved to be a set back both for Brüning and his immediate efforts to guide Germany through a critical economic situation and for German democrats anxious to preserve the republican order. Capitalizing upon economic discontent and the political fanaticism which economic disorder tended to crystallize, the Communists and the National Socialists (especially the latter) were able to register substantial gains in September. The Weimar parties and the others in the Great Coalition lost heavily. When it became apparent that members of Brüning's government were unwilling to invite the Socialists to participate in government, all hope faded that the German government might proceed in the usual parliamentary way. Instead, the 1930 elections initiated a period of crisis government characterized by parliamentary inaction, government by toleration, and rule by Article 48. Parliamentary government in Germany had come to an end.

## PSYCHOLOGY

### THE RELATIONSHIP OF VARIOUS TYPES OF MOVEMENT RESPONSES IN THE RORSCHACH TEST TO PERSONALITY TRAIT RATINGS

(Publication No. 2375)\*

Robert Poindexter Barrell, Ph.D.  
University of Michigan, 1951

This study was an experimental test of a number of current principles of interpretation of the movement responses on the Rorschach test, as reported in the literature.

The following hypotheses were investigated:

1. the number of human movement responses is significantly related to various types of intellectual functioning;
2. the various categories into which the human movement responses may be subdivided are differentially related to various categories of intellectual functioning;
3. some categories of human movement responses show significant relationships to different categories of emotional behavior;

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\* Microfilm copy of complete manuscript of 194 pages, \$2.43. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-119.

4. the number of animal movement responses, and particularly the ratio of human to animal movement, are significantly related to various categories of emotional behavior;

5. the number of inanimate motion responses is significantly related to some personality variables.

The subjects were 121 men who had been selected for training in clinical psychology and who were studied intensively at Ann Arbor, Michigan, during the summer of 1947 in conjunction with the Veterans Administration Assessment Program for Clinical Psychologists. The Staff's pooled ratings on various intellectual and emotional traits were utilized as criterion measures. The basic hypotheses were restated in terms of traits used to test them, and the hypotheses were then tested by chi-square and correlational techniques.

Variables were eliminated which did not yield satisfactory inter-scorer reliability, except in special instances. Because of the possibility that the significant relationships of the movement variables and the criterion traits might be a function of the total number of responses, partial correlations, with total number of responses held constant, were computed. Similarly, for the subcategories of human movement, partial correlations, with number of human movement responses held constant, were calculated.

The following findings emerged: (1) the number of human movement responses is significantly correlated with the criteria of intellectual functioning, even when the number of responses is partialled out; (2) while the subcategories of human movement are differentially related to the intellectual variables, these relationships are not independent of the number of human movement responses; (3) the subcategories of human movement responses are not differentially related to the emotional criteria; (4) the number of animal movement responses and the ratio of human to animal movement in general yielded chance correlations with the criterion variables; (5) the number of inanimate movement responses is not related significantly to any of the criterion variables purportedly measuring "inner tension." Inter-scorer reliability on this last Rorschach variable was very low.

Our findings indicate that the clinician is justified in utilizing the number of human movement responses as a partial indicator of intellectual functioning and imagination. However, since our subcategories of human movement are not independently related either to the intellectual or emotional variables, the use of these subcategories does not appear to be justified. Neither do our data substantiate the widespread use of animal movement responses as an indicator of immaturity. The last two conclusions must be treated with caution in view of the highly selected population employed in our study, but at least justify a skeptical attitude towards

these Rorschach variables pending further investigation of their possible validity.

**AN EXPERIMENTAL STUDY OF THE FACTORS INVOLVED  
IN THE PROBLEM SOLVING OF CHILDREN FROM  
SIX MONTHS TO SIX YEARS OF AGE**

(Publication No. 2461)\*

Paul Porter Brainard, Ph.D.  
University of Michigan, 1931

**Purpose of the Study:**

To determine what factors aid or hinder the solving of practical problems by children as they develop mentally and physically from six months to six years of age.

**Method of Approach:**

Ten experimental problems were selected out of a preliminary list of seventy. Each experiment presented a series of separate but related problems ranging from easy to difficult for a normal two year old child. The easiest phase was usually solved by children under one year of age. The most difficult phase was usually solved only by the five and six year old children.

The ten experiments were as follows: (1) going around a barrier to reach objective; (2) removing pasteboard cover to get doll from carton; (3) securing a doll behind, in and under a box; (4) taking object from screen box with hinged door; (5) securing object too high to reach by jointing two sticks; (6) securing red candy stuck to bottom of quarter-pint milk bottle with small stick near; (7) securing objects, by use of stick, from a box with small holes in top and bottom; (8) obtaining object hanging from string which has been run through a ring in the ceiling and thence to a hook on the wall three feet from the floor; (9) securing object on upper side of double clothes line; (10) using lever motion to get object out of a hole.

**General Summary and Conclusions:**

In this study, manipulative problems were presented to two hundred and twenty-nine children of about the same I. Q., at each month level from six months to six years of age. The number of cases for each month was from one to five in the series of ten experiments. The problems were presented, (1) under standard

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conditions, noting readiness of solution and variety of responses at each age level, and (2) under varying conditions, in which a solution was forced, if possible, by a series of cues ranging from indirect to direct, including shifting of material and verbal suggestion. Two thousand, two hundred and forty-four experiments were given on seventy-four different manipulative problems. Experiment was also developed with a marble maze and a puzzle box.

The reactions given in trying to solve these problems were classified, under "wrong moves" and "right moves." It was found that the direction of attention changed with certain external conditions, such as having the objective clearly in view, while the blocking features were more obscure; having the right avenue of approach clearly contrasted with its surroundings and having a useful tool in the same visual field as the objective to be reached by it.

There were also mental conditions which affected the direction of attention. If a problem had just been solved by the use of a certain opening or by a special tool, this opening or this tool would again be noticed and used in the next problem. If a child had been in the habit of using certain objects in certain ways at home, similar objects in the experimental room aroused the same tendencies. These facts correspond to the analysis of factors influencing attention described by Pillsbury, such as intensity, change, the idea in mind, and earlier education.

The objective and subjective factors governing attention are found to be chiefly responsible for the making of right or wrong moves. This means that errors can be greatly increased by objective deception and by giving the wrong mental set. Conversely, errors can be decreased by calling attention to certain features which lead to the goal, or by giving suggestions or training which shifts thinking into the right field. The mental set was found to be more important in children over two years of age than in those below two years. Muscular factors play some part in solving problems demanding skill. Muscular difficulties appear more often among children below four years of age. The social factors are also important, in that social conditions may produce inhibitions, or may increase motivation. When language is introduced, it plays a large part in directing attention. It is evident from these facts, that guidance factors are important in the solution of problems.

The factors mentioned do not fully explain the matter of "insight" as that term is generally used. Insight is best explained on the basis of a change in attention, plus the integration of dominant ideas into a single pattern or gestalt. This fusion takes place by the use of concepts, or when there are sufficient common elements to provide a linkage.



**Conclusions:**

1. The ability to solve problems develops continuously from six months to six years of age.
2. Every attempt to solve a problem exhibited four fundamental characteristics.
  - (1) The child is excited by some objective in his environment.
  - (2) He strives toward it, paying no attention to other things.
  - (3) He is blocked in his attempt and begins to react toward the obstacle, to vary his movements to get around it; or he may withdraw, become angry, knock the material about, cry, ask for help, etc.
  - (4) He continues to act toward the goal, eventually giving up or following some one line of attack to success.
3. The two important factors which determined success or failure in all the problems: (1) attention to the right focus of attack, and (2) meanings of the parts observed in relation to the goal.
4. If the mental set is too strong in one direction, a period of inactivity may permit elements previously inhibited to emerge.
5. Insight is present in some degree whenever a selection of movements is made with reference to the goal-idea.
6. The developing ability to solve practical problems depends in some degree upon increased strength and better muscular coordination.
7. The development depends still more upon experiences, retained as memories, which give meaning to the material involved.
8. There are many other factors influencing problem solving which need further study, such as the effect of emotional attitudes, social inhibitions, habits of attacking a problem, variation in motivation, and the vector forces related to distance of the goal and the position of other objects in the field.

**STABILITY OF THE SELF-CONCEPT AS A DIMENSION  
OF PERSONALITY**

(Publication No. 2385)\*

John Jonah Brownfain, Ph.D.  
University of Michigan, 1951

The purpose of this study was to develop an operational measure of the stability of the self-concept and to demonstrate that

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stability of the self-concept is a dimension of personality serviceable to the work of understanding and predicting behavior. The self-concept is defined as that system of central meanings which the individual has about himself and his relation to the social world about him.

The primary data of this investigation consist of several series of self-ratings on twenty-five personality variables, obtained successively under different instructions from sixty-two members of two men's cooperative houses at the University of Michigan. Under one set of instructions, the subject gave himself the benefit of any realistic doubt he had about his standing on each inventory item, thus yielding a "positive" self-concept. Under another set of instructions the subject denied himself the benefit of such doubt, thus yielding a "negative" self-concept. The absolute differences between these positively and negatively slanted self-ratings on each item, summed over all the items of the inventory, was the operational measure of stability. The larger this discrepancy the more unstable the self-concept is assumed to be. This measure of stability has an estimated reliability of .93, and support for its validity was found in its significant relationship to other variables which are considered to reflect stability of the self-concept.

The null hypothesis was: there is no difference on criteria of adjustment between subjects who, on the basis of the operational definition, had the most stable self-concept and subjects who had the least stable self-concepts. In making this hypothesis, it was assumed that stability reflects an integrative function rather than rigidity of personality. Therefore, the fifteen subjects identified as rigid (on the basis of high scores on the F (Predisposition for Fascism) Scale developed by Frenkel-Brunswik) were eliminated from the sample before testing the hypothesis.

Adjustment was measured in terms of (a) the group's evaluation of the subject, (b) the subject's scores on the Guilford-Martin Inventory of Factors GAMIN, and (c) inferences about adjustment derived from the subject's behavior in rating himself and others. Fisher's "t" was used to test significance of differences between the means of these measures for the fifteen subjects with the most stable and the fifteen subjects with the least stable self-concepts.

All findings support the theoretical prediction that subjects with a stable self-concept are better adjusted than those with an unstable self-concept. The following are the more salient of the findings which favor the subjects with more stable self-concepts ( $P$  is .05 or better):

1. They are better liked and considered more popular by the group.
2. They are freer of inferiority feelings and nervousness as measured by the GAMIN.

3. They have a higher level of self-esteem as manifested by a higher mean self-rating and also by a higher self-rating on the inventory item defining self-acceptance. The inter-trait variability of their self-ratings is lower, indicating that their self-esteem is generalized.

4. They see themselves more as they believe other people see them.

5. They know more people in the group and are better known by the group, indicating more active social participation.

6. They show less evidence of compensatory behavior of a defensive kind.

It is concluded that stability of the self-concept is an important dimension of personality, one which lends itself to operational definition and convenient measurement, and one which appears to be useful in understanding behavior and in predicting adjustment.

#### EXTINCTION OF A CONDITIONED OPERANT RESPONSE AS A FUNCTION OF THE EXTINCTION SCHEDULE

(Publication No. 2480)\*

Donald Hartmann Bullock, Ph.D.  
Columbia University, 1950

The following experiment dealt with the effect upon the extinction of a conditioned operant response of two factors related to the extinction schedule: (1) length of time of extinction periods during which the response could occur, timein periods; (2) the duration of time intervals separating timein periods, timeout intervals. The influence of these two variables was analyzed with respect to: (1) the rate of response at different stages of the extinction; (2) the resistance to extinction as measured by the total number of extinction responses.

The apparatus consisted of Columbia Skinner boxes, living-experimental cages; removal levers; manually operated food-magazines; and polygraphic recorders.

The experimental procedure consisted of the following steps: (1) habituation and establishment of a feeding schedule; (2) meas-

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\* Microfilm copy of complete manuscript of 49 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-223.

\*\* This research was conducted at the Psychological Laboratories of Columbia University in 1947. The author is indebted to Professors F. S. Keller and W. N. Schoenfeld for their invaluable assistance.

urement of the operant level during 5 consecutive daily half-hour sessions; (3) measurement of the operant level during 4 consecutive daily 32-minute sessions during which the lever was present or absent according to the schedule to be used during extinction; (4) conditioning of the lever-pressing response by means of food reinforcement during 2 consecutive daily sessions, 30 continuous reinforcements the first day, 50 continuous reinforcements the second day; and (5) extinction according to a pre-arranged schedule on the day immediately following the second conditioning day.

The extinction schedules consisted of systematic variation in timeout intervals and timein periods. There were 1, 2, 4, and 8 minute timeout intervals and timein periods. In each subgroup of 4 rats one timeout interval and one timein period duration was used, a total of 16 combinations (64 experimental subjects) thus being established. For each animal extinction consisted of 32 minutes of interrupted extinction (the lever available a total of 32 minutes for each rat) and 4 1/2 hours of noninterrupted extinction, a total of 5 hours of lever availability.

With regard to the effect of the timeout interval durations, the data indicated a general trend for longer timeout intervals to generate: (1) an increased initial rate of response during the first 32 minutes of extinction; (2) no significant differences in the total number of extinction responses in the total 5 hours of interrupted and noninterrupted extinction.

With regard to the effect of the timein period duration, supplementary control experiments demonstrated conclusively that a complicating variable — the number of interruptions — was the significant factor. With greater numbers of interruptions (1) there was an increased initial response rate; and (2) there was an increased total number of extinction responses.

Additional data were presented concerning the relationship between what Skinner has termed the "remaining reserve" and response rate. In line with Skinner's hypothesis, the response rate is a function of the size of the remaining reserve.



# THE RELATIONSHIP BETWEEN EXAMINER ANXIETY AND SUBJECTS' RORSCHACH SCORES

(Publication No. 2388)\*

Sidney Earl Cleveland, Ph.D.  
University of Michigan, 1951

The Rorschach Test is usually interpreted solely in terms of the subject's personality. Traditionally there has been little appreciation of the possible influence of an examiner's personality on the subject's test responses. Accordingly, this study is concerned with two major problems: (1) whether different examiners elicit from their subjects significantly different Rorschach scores and (2) whether these differences in the subjects' Rorschach scores are related to examiner anxiety. The first problem was studied jointly by Richard Sanders and the present author.

Nine graduate psychology students were administered a series of personality tests by the authors. These students were trained in the administration of the Rorschach Test, and each student then administered the Rorschach to thirty randomly assigned, volunteer, male, college sophomores. Immediately following the testing, each subject checked a questionnaire designed to measure some of his feelings toward his examiner. The Rorschach Tests were randomly assigned to two experienced clinicians for independent scoring.

The first major problem was attacked in the following manner. The variance contributed by different examiners to their subjects' Rorschach scores was analyzed for each of forty scoring categories. Significant examiner differences were found for twenty of these categories. Eight of these twenty scores are relatively independent of the general productiveness of the subjects and of each other. It is concluded that different examiners elicit significantly different Rorschach scores from their subjects.

In order to study the second major problem, two criteria of examiners' anxiety were developed. One measure of anxiety was obtained from the subjects' responses to the questionnaire in which they used various adjectives pertaining to anxiety to describe their examiners. The resulting measure was regarded as an index of overt anxiety. A second criterion of examiner anxiety was obtained by a rating of the Rorschach protocols of the nine examiners in terms of Elizur's "Rorschach Content Test." It was assumed that this score provides a measure of covert anxiety. The examiners

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were then ranked on these criteria, and the obtained Rorschach scores of the three highest and three lowest compared. The results of these analyses reveal that:

1. Nine of the Rorschach scores were significantly related to examiner anxiety.

2. An interpretation of these results reveals that, in general, the examiners described by their subjects as high in anxiety, elicit more general responsiveness, more hostile content, and more emotional responsiveness than low-anxiety examiners. In addition, the subjects express a greater liking for examiners characterized on the questionnaire as low in anxiety than do the subjects of high-anxiety examiners.

3. Subjects of examiners ranked high on covert anxiety tend to respond more passively and with more hostile fantasy than do subjects of the low-ranked examiners. However, subjects do not distinguish between the extreme examiners on covert anxiety in respect to liking and desire for emotional distance.

In summary, it is concluded that differences in certain Rorschach scores of the subjects are related in a small but significant degree with examiner anxiety.

#### SOME FACTORS INFLUENCING THE ACCURACY OF UNDERSTANDING PERSONALITY

(Publication No. 2394)\*

Charles Alvin Dailey, III  
University of Michigan, 1951

The general problem investigated in this thesis was the determination of conditions favorable to developing an understanding of the particular individual. The specific problem was to determine the effects of making a premature judgment of an individual upon the judge's subsequent appraisal of that individual.

The principal hypotheses were: (1) premature judgment renders the judge less able to "profit" from experience with an individual so that the judge does not improve in understanding as he is given more data about the individual; and (2) premature judgment "freezes" the judge's appraisal so that he is relatively unable to alter his judgments as he gains further information about the individual.

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The following experimental designs were employed to test these hypotheses. The judges used were 41 members of classes in introductory psychology (hypothesis 1) and 91 members of classes in experimental psychology.

To test the first hypothesis, judges were allowed to read a small portion of an individual's autobiography and then required to fill out a personality inventory in the manner in which they considered the individual would respond. Filling out the inventory at this point was defined as the premature judgment.

Then they were allowed to resume reading the autobiography; when they completed a brief additional section, they were again required to fill out the inventory for the individual. The accuracy of the predictions was measured by comparing the predictions of each judge with what the individual had in fact responded to the questionnaire. The mean accuracy score (mean number of correct predictions) was compared with that of a control group which had omitted the premature judgment, substituting a pause for it, but which had read exactly the same information as had the experimental group. According to the hypothesis above (1), the control group should have earned a higher accuracy score than the experimental group.

To test the second hypothesis, judges were required to make predictions of how an individual would respond to a questionnaire at two points: (a) before they had read any of his autobiography, so that they were merely guessing; and (b) after they had read a small amount of his autobiography. (a) corresponds to the "premature judgment" described in the first experiment. The number of predictions which were identical at (a) and (b) was calculated for each judge and compared with the number of predictions which were identical at (a) and concerning some previous individual for whom the judge had previously filled out the inventory. The latter constitutes a control for "stereotypy" of the judge's predictions.

The null form of each hypothesis was rejected on the basis of the experiments described. The differences between groups in each case were in the direction theoretically expected.

The additional hypothesis was tested that, if the effect of premature judgment on understanding is linked to the freezing effect of premature decisions, there should be an inverse correlation within the experimental group used in hypothesis 1 between the judge's ability to predict the individual's inventory responses and his tendency to repeat premature judgments when making his final judgments. This correlation was found to be  $-.54$ ; it differs significantly from zero.

The conclusions drawn are that premature judgment operates to "freeze" the judge's opinions of the individual at the point of premature judgment so that his ability to profit from additional data about the individual is reduced.

# OBJECTIVE AND PROJECTIVE MEASURES OF WITHDRAWAL BEHAVIOR

(Publication No. 2482)\*

Edmond Francis Erwin, Ph.D.  
Columbia University, 1950

The study dealt with objective and projective methods of investigating personality. The specific aspect of personality selected for investigation was withdrawal behavior. Various objective and projective measures, described by different authors as measures of withdrawal behavior, were used. These measures were: (1) the Picture Arrangement subtest of the Wechsler-Bellevue Scale, Form I, (2) the Picture Arrangement subtest of the Wechsler-Bellevue Scale, Form II, (3) the S Inventory, which consisted of the Factor S items of the Guilford-Martin Inventory of Factors STDCR and other similar items, and (4) the Rorschach Technique of which only H and Hd scores were considered. In addition, a Rating Scale designed to measure withdrawal tendencies or lack of such tendencies was included.

The subjects used in the study consisted of thirty psychoneurotics, thirty schizophrenics, and thirty normals. To be included in the study each of the patients had to be rated as withdrawn by a psychiatrist and by each of two psychologists, the Rating Scale being the instrument for rating. Similarly, there had to be agreement among the ratings of a psychiatrist and two psychologists that the normal subjects were outgoing (lacking in withdrawal tendencies). In addition, anecdotal material was collected on each subject as evidence of withdrawal tendencies or lack of such tendencies.

Each of the above listed measures was administered to every subject. The hypotheses to be tested were:

1. Individuals who are rated as withdrawn receive lower Picture Arrangement Scores on the Wechsler-Bellevue, Form I and II, than individuals who are rated as outgoing.
2. Individuals who are rated as withdrawn receive lower H and Hd scores on the Rorschach Technique than individuals who are rated as outgoing.
3. Individuals who are rated as withdrawn receive higher scores on the S Inventory than individuals who are rated as outgoing.

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\* Microfilm copy of complete manuscript of 92 pages, \$1.15. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-225.

The "t" test for the significance of the difference in mean scores, the analysis of variance, the analysis of covariance to measure differences after the group means were adjusted for differences in education and intelligence, and correlational techniques were applied to the scores from the three groups.

The general conclusion derived from the analysis of the data was that the hypotheses were supported. The specific conclusions were as follows:

1. The mean of the scores for each of the withdrawn groups (neurotics and schizophrenics) was significantly lower than the mean of the scores for the outgoing group (normals) on the Picture Arrangement subtests of the Wechsler-Bellevue, Form I and II.

2. The mean of the scores for one of the withdrawn groups (neurotics) was significantly lower than the mean of the scores for the outgoing group on both the H and Hd factors of the Rorschach Technique. The mean of the scores for the other withdrawn group (schizophrenics) was significantly lower than the mean of the scores for the outgoing group on the Hd factor of the Rorschach Technique, and lower on the H factor but not significantly so.

3. The mean of the scores for each of the withdrawn groups was significantly higher than the mean of the scores of the outgoing group on the S inventory, which is in the expected direction.

4. When the effect of education and intelligence on the differences among the three groups is accounted for, there are still significant differences among the groups on all measures and in the direction expected for the withdrawn groups.

5. For the total group a team consisting of Picture Arrangement scores from the Wechsler-Bellevue, Form II, and the S Inventory, gave almost as good prediction of scores on the Rating Scale as did the team consisting of all the measures.

#### THE RELATIONSHIP BETWEEN GUIDANCE AND THE SPECIFICITY OF THE FIXATED RESPONSE IN THE RAT

(Publication No. 2403)\*

Robert S. Feldman, Ph.D.  
University of Michigan, 1950

Maier and Klee conducted a study which demonstrated that abnormal fixations produced by placing rats in insoluble problem situations could be effectively changed by manual guidance. The

\* Microfilm copy of complete manuscript of 103 pages, \$1.29. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-147.



guidance technique prevented the animal from making an incorrect response in a Lashley jumping apparatus by the experimenter's placing his hand beside the animal, nudging it to the other side, and forcing a correct response. The present study was designed, primarily, to investigate the mechanism of guidance and, secondly, to investigate the stimuli that control the fixated response.

Preliminary studies were first carried out to establish a technique which would permit fixated rats to make a correct response on alternate trials by walking along a run-way extending from the jumping platform to the stimulus windows. In the formal experiment, a group of rats was frustrated in an insoluble problem, and most of these animals developed behavior fixations. Rats were then permitted to learn to walk to the correct card on alternate trials. The results showed that within the limits tested, most animals learned to make the correct response on walking trials, but this success was ineffective for altering the non-adaptive jumping responses in the same problem. Also, during subsequent trials, one group of these rats had the runways gradually shortened on alternate trials; one group had the runways suddenly shortened by two-thirds; and one group alternated jumps of 7 inches with regular jumps of 8 1/2 inches. The data showed that many rats consistently practiced incorrect jumping responses while making adaptive responses in the same problem under slightly different conditions (walking rather than jumping). The trend of the data also suggested that gradual shortening of the runways would eventually cause the abandonment of the fixated response, but sudden shortening of the runways was more likely to cause fixation of the related responses. Because of small rat populations, this latter hypothesis could not be statistically validated.

The data led to the following conclusions.

1. Fixated behavior is not due to defective learning ability since correct responses in a problem situation can be coexistent with fixated responses when the mode of execution is different (walking instead of jumping).

2. Maier and Klee's suggestions that guidance was effective because it prevented the exercise of the fixated response, that guidance was frustration free, or that during guidance the animal escaped from the fixation, were not supported. Walking responses served these attributes, yet were ineffective in altering fixations.

3. The fixated response is probably not a response to a position or stimulus card, but rather, a specific response to a specific stimulus situation. This conclusion is based on the fact that before transfer occurred, the modes of execution of the response had to be relatively very familiar.



## RELATIONSHIP BETWEEN APTITUDE SCORES AND CERTAIN RORSCHACH INDICES

(Publication No. 2342)\*

Leo Goldman, Ph.D.  
Columbia University, 1950

### Purpose of the Study

Relationships between intra-individual scores on several aptitude tests and certain Rorschach indices were examined. The results of this study were expected to contribute to theoretical understanding of the nature of aptitudes and toward definitions of aptitudes that would be more explanatory than the usual operational type of definition. The results of this study were expected to provide the user of aptitude tests with greater understanding of the psychological meaning of test scores and to enable counselors and others to synthesize more effectively the scores of an individual on a battery of tests.

### Hypotheses

The following general hypothesis was tested:

There are consistent relationships between certain intra-individual aptitude test scores and certain Rorschach indices.

The following specific hypotheses were tested:

1. Those High on the D.A.T. (Differential Aptitude Tests) Verbal Reasoning Test, as compared with those Average and Low, should have the following Rorschach Check List indices:
  - a. Lower F% and lower form level.
  - b. Greater use of W.
  - c. Greater use of the three Movement items, M, FM, and Total Movement.
  - d. More frequent emphasis on M in the M:C ratio.
  - e. Greater use of CF.
2. High on the D.A.T. Numerical Ability Test:
  - a. Higher F% and higher form level.
  - b. Lower scores on the three Movement items, M, FM, and Total Movement.
  - c. Less use of CF.
3. High on the D.A.T. Abstract Reasoning Test:
  - a. Higher F% and higher form level.

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- b. Lower scores on the three Movement items, M, FM, and Total Movement.
  - c. Less use of CF.
- 4. High on the D.A.T. Space Relations Test:
  - a. Higher F% and higher form level.
  - b. Lower scores on the three Movement items, M, FM, and Total Movement.
  - c. Less use of CF.
- 5. High on the D.A.T. Mechanical Reasoning Test:
  - a. Higher F% and higher form level.
  - b. Lower scores on the three Movement items, M, FM, and Total Movement.
  - c. Less use of CF.
  - d. Narrower in Range.
- 6. High on the D.A.T. Clerical Speed and Accuracy Test:
  - a. Greater use of Dd.
  - b. Narrower in Range.
  - c. More signs of immaturity: FM excessive while M deficient; CF excessive while FC deficient.

#### Statistical Procedures

For each D.A.T. part, the High, Average, and Low groups were compared with each other in order to find Rorschach Check List items that differentiated them. A total of 162 such comparisons were tested for significant relationships by computing chi-square. Where the P value of chi-square was .05 or less, the product-moment coefficient was computed in order to provide a measure of degree of relationship.

Other statistics computed included mean and standard deviation of the 96 subjects on each D.A.T. part, intercorrelations of the D.A.T. parts, and certain relationships between raw scores and intra-individual scores on the D.A.T.

Inter-scorer reliability of the Check List items was determined by having two scorers independently complete Check Lists for 25 cases.

#### Results

It was concluded that, except for the few confirmed hypotheses, the general and specific hypotheses were not supported. The explanation of these results may be one or more of the following:

1. It may be that there are indeed no consistent relationships between aptitudes and Rorschach results.
2. The Rorschach test may not be a reliable and valid measure of personality differences among aptitude score groups.
3. A given score on one of the D.A.T. parts may not represent the same psychological processes among different subjects. If this is true, it may follow that consistent Rorschach correlates of D.A.T. scores are not to be expected.

### Implications

The expected theoretical and applied contributions cannot be made from the results as reported. Definite rejection of relationships between aptitudes and Rorschach scores must await more conclusive evidence; generalizations from the present study cannot be made beyond the specific instruments and population involved.

## AN INVESTIGATION OF DIFFERENCES IN INTELLECTUAL FACTORS BETWEEN NORMAL AND NEUROTIC ADULTS

(Publication No. 2408)\*

Gerald Leslie Hover, Ph.D.  
University of Michigan, 1951

This study was concerned with the verification of the assumption that intellectual structure and personality organization are interrelated. The major hypothesis investigated was: There are differences in the factorial structure resulting from an analysis of the subtest intercorrelations of the Wechsler-Bellevue Intelligence Scale, Form I, between two matched, known groups, a normal group and a neurotic group.

All subjects in both groups were white, male, adult veterans between 21 and 31 years of age. The first group consisted of 100 out-patients, whose symptomatology was equivalent to that listed by Fenichel as typical of anxiety neurosis. The second group was composed of 100 normal subjects who had never been treated or hospitalized for mental disorders. These subjects were selected and tested jointly with James S. Simkin, who was conducting a comparable study with schizophrenic patients. The normal and neurotic groups were closely matched for age and education.

All subjects were administered the complete Wechsler-Bellevue Intelligence Scale, Form I. Correlational matrices were prepared for each group, based on the correlations among the 11 subtests of the Wechsler-Bellevue Intelligence Scale, Form I. These matrices were factor analyzed utilizing Thurstone's complete centroid method. The coded centroid matrices were rotated separately by both the writer and an independent team of experts.

The intellectual structure of the normal group was defined by a General Factor (mean variance, 34%), loaded by all subtests; a Verbal Factor (mean variance, 9%); a Visual-Motor Factor (mean

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variance, 4%); a unique-residual factor designated Digit Span (mean variance, 4%); and a residual factor (mean variance 3%).

The intellectual structure of the neurotic group was defined by a General Factor (mean variance, 35%), loaded by all subtests; a Performance Factor (mean variance, 10%); a factor designated Social-Cultural Understanding (mean variance 8%); an Attention-Concentration Factor (mean variance 4%); and a unique-residual factor designated Block Design (mean variance, 4%).

Comparison of the resulting factorial structures indicates that the intellectual structure of a normal group and that of a neurotic group matched for age, education, race, and sex, can best be described as integrated, while evidence of intellectual differentiation also appears in both groups. The intellectual structure of the normal group and that of the neurotic group are markedly similar in certain respects, while the intellectual structure of a matched group of schizophrenics differs markedly from that obtained for the two former groups. It appears, however, that there are small but probably significant differences between the intellectual structure of the normal group and that of the neurotic group. The assumption that intellectual structure and personality organization are interrelated is thus supported by this finding.

On the basis of ancillary findings, it was concluded that although group differences in inter-test variability appear, it is not possible to differentiate normal, neurotic, and schizophrenic individuals reliably using inter-test variability as an index. It was also concluded that it is not possible to differentiate normal and neurotic individuals reliably on the basis of diagnostic or pathognomonic signs. Our findings also strongly suggest that the standardization of the Wechsler-Bellevue Intelligence Scale, Form I, is inadequate for its use on a national scale.

#### PERSONAL INFLUENCE AND OPINION CHANGE IN CONFERENCES

(Publication No. 2411)\*

Harry Levin, Ph.D.  
University of Michigan, 1951

In a study of personal influence and opinion change in conferences, thirty four-member conferences were observed. Twenty-four graduate students in clinical psychology made up these groups

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and were so rotated that each individual had an opportunity to work with every other at least once. The task of these groups was to arrive at group decisions on forty-two ratings concerning the prediction of success in clinical psychology of people now receiving training in graduate school. The decisions were based on test and autobiographical material available for each trainee. Each participant decided on his own ratings before the conference.

Opinion change was calculated as the difference between a participant's own-rating and the group decision on that item. The amount that the other three participants changed in the direction of a participant's own-rating represented his influence. In addition, the attitudes of the participants toward each other along the dimensions of liking, prestige, and value in reaching the group decision were measured by questionnaires. Also measured were the amount that each participant verbally participated and the objective quality of the own-decisions. The relations between a participant's opinion change, influence, and satisfaction with the group's decisions were explored.

## I Results

1. Participants showed no consistency in their influence and change scores from item to item within a case, from case to case within a meeting, or from meeting to meeting within the program. Therefore, in these groups, influence and change are reflections of factors which are specific to each item-decision and not of factors characterizing the participants as persons.

2. The most frequent decision making process was for the four participants to move to the mean of their own ratings.

3. The more that a participant had to change his own rating in reaching the group decision, the less satisfied he was with that decision.

4. The participants found those groups attractive in which the members liked, valued, and considered each other prestigious. However, members of the attractive groups were neither more satisfied with the decisions, had no higher quality decisions, nor evidenced more sincere change of opinion than the members of the less attractive groups.

## II Conclusions

In the groups studied, influence and opinion change in reaching a common decision are not consistent characteristics of the individual participants but are a function of the disparity in each decision between a person's initial opinion and the average opinion of the others.

Groups which arrive at decisions in the manner of these groups are characterized as "individualistic," meaning that the participants have an attitude of low involvement with the group task and are principally concerned with their own opinions.



ACQUISITION AND EXTINCTION OF A CONDITIONED  
RESPONSE UNDER THREE DIFFERENT PATTERNS OF  
PARTIAL REINFORCEMENT

(Publication No. 2429)\*

Eleanor E. Maccoby, Ph.D.  
University of Michigan, 1951

It has been shown that regularity of reward is important in determining how easily a habit can be broken. Behavior learned under conditions of intermittent reward (partial reinforcement) persists longer after reward is withdrawn (experimental extinction) than behavior which has been rewarded every time it has occurred. Another important but more often neglected aspect of the effects of intermittent reward is: what effect does intermittent reward have on the energy or speed of responding over a period in which reward is still being given? Some experiments suggest that the speed of responding is greater when reward occurs for every response; other experimental results seem to suggest the opposite: that responding is maintained at a higher level when reward occurs only occasionally. The major objective of the present experiment is to study the effects of several different patterns of intermittent or partial reward, to determine under what conditions a given amount of reward will produce rapid responding, and under what conditions a given amount of reward, differently spaced, will lead to lower levels of responding.

In this experiment hungry pigeons were placed in an apparatus (a Skinner box) in which they could obtain small amounts of food by pecking a plexiglass disc. The apparatus was set so that the birds did not receive a feeding for every peck, but were fed only occasionally. The pattern of these rewards could be varied, and the following three systems of intermittent reward or partial reinforcement were employed:

Group I. (Random Ratio reinforcement). Reward was given after a fixed number of pecks. The number of pecks required for a reward was variable — sometimes only one or two pecks would bring a feeding, sometimes over a hundred were required.

Group II. ("Rapid Responding" reinforcement). Birds received a feeding every three minutes on the average, although the time between feeding was varied. When the required time had

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elapsed, a feeding was given only if the bird was responding at a certain minimum rate of speed (2 1/2 responses per second).

Group III. (Aperiodic reinforcement). Reward was given for the first peck after a given amount of time had elapsed. On the average, the birds were fed once every three minutes, although the time between feedings was varied — sometimes feedings would be successive, sometimes a period of six minutes would intervene between rewards.

The pigeons were divided into three groups, and one group was trained under each of the three schedules. The principal findings are:

1. Pigeons rewarded for completing a given number of responses (group I) responded more rapidly than pigeons rewarded after a given interval of time (group III). This result occurred despite the fact that the birds in the two groups were equally hungry, had the same number of feedings, and gave an equal number of pecks for each reward.

2. When reward coincided with a fast rate of responding (group II), the rate of pecking was much greater than when this coincidence did not occur (group I), even though the increase in rate did not yield more frequent rewards.

3. When all reward was removed (experimental extinction), group II which had been fed only for pecking rapidly gave the largest number of responses. The other two groups (Aperiodic and Random Ratio reinforcement schedules) gave approximately the same number of pecks in experimental extinction despite their different rates of pecking during training.

These results indicate that rate of responding is a parameter of learning capable of differential reward and thus experimental manipulation, and suggests explanation of previous results in these terms.

**SOCIAL CLASS AND RACE AS FACTORS AFFECTING THE  
ROLE OF THE FAMILY IN THEMATIC APPERCEPTION  
TEST STORIES OF MALES**

(Publication No. 2370)\*

Howard E. Mitchell, Ph.D.  
University of Pennsylvania, 1951

**The Problem:**

The importance of familial experience in conditioning personality has been studied in the light of many different conceptual frames of reference. Other than the work of psychoanalytically trained investigators, most of the attempts to describe the role of the family and its effects upon personality development have been made by sociologists or cultural anthropologists, whose methods are largely those of the participant observer or historian. In this study, however, our central objective is to investigate differences in projective expressions about the role of the family as a function of social class (lower vs. middle) and racial group (Negro vs. white) membership in stories to four pictures of the Thematic Apperception Test. In order to accomplish our objective the following hypothesis was formulated:

There will be differences concerning familial role in the TAT projections of the sub-cultural groups studied and these differences will be principally between the social class groups and to a lesser degree between the racial groups.

**Subjects:**

160 male native born adults residing in metropolitan Philadelphia served as subjects. The participants were divided into four subgroups of 40 each: (1) Negro lower social class, (2) white lower social class group, (3) Negro middle class group, and (4) white middle class group. The criteria for defining social class status were: (1) formal educational level which the subject had reached, (2) highest occupational class of subject's parent (i.e., the occupational class of the family "bread winner") at the time the subject lived in the parental home, and (3) the occupational class of the subject himself. Only those subjects that met all of the above criteria were included in the study.

**Procedure:**

Four TAT cards (1 BM, 2, 6BM and 7 BM), which normally

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yield family themes, were administered following Murray's instructions. A rating schedule developed to judge the stories included 17 variables, such as, what are the figures called when mentioned, characterization or description of the familial figures, nature of methods used to motivate hero or central figure toward goals, etc. The judgments were made by two groups of five trained raters each to insure the reliability of the data. Appropriate statistical tests were then made to ascertain those significant differences which obtained among the four sample groups.

#### Results and Conclusions:

The findings demonstrate that in general the major ways in which our male subjects represented the family in their projections depended upon their social rank rather than their color group identification. This is true both in terms of the frequency of the significant differences and in terms of the magnitude of the significant differences found between the groups studied. Without an exception, the differences of greatest magnitude (i.e., with tetrachoric correlations of  $+ .50$  or greater) are social class rather than racial group differences.

From the results the following conclusions were made:

1. The significant differences that were most frequent and of greatest magnitude were between the social class groups.
2. There were fewer and less marked (i.e., in terms of magnitude) racial group differences than social class differences in the projections about familial role by the four groups studied. Most of these racial differences and those of highest magnitude are related to the role played by the mother in the stories told by the two color groups.
3. On other aspects of familial role there were no differences between the social class or racial groups.
4. From the three conclusions just cited we see that the major ways in which male subjects expressed the role of the family in TAT stories were more frequently a function of social class than racial group membership. There were, however, other aspects of family life (demonstrated in the projections) which are the same, regardless of one's social class or racial group identification.

AREAL EFFECTS IN FOVEAL BRIGHTNESS  
DISCRIMINATION

(Publication No. 2488)\*

Philburn Ratoosh, Ph.D.  
Columbia University, 1950

The effect on foveal brightness discrimination of changes in the diameters of the test- ( $\triangle I$ -) and adapting- ( $I$ -) fields has been investigated.

An apparatus has been described designed to present to one eye of the subject a foveal, circular illuminated  $I$ -field to which may be added a concentric, circular  $\triangle I$ -field, smaller than or equal in size to the  $I$ -field. The  $\triangle I$ -field was presented for a duration of 0.02 second.

For constant sizes of test- and adapting-field, the curve relating  $\log \triangle I/I$  and  $\log I$  falls rapidly at low values of  $\log I$ ; it then levels off at medium values of  $\log I$ . At high values of  $\log I$ , when the adapting-field is not larger than the rod-free area of the fovea, the curve usually shows a small final rise.

For a given brightness and constant test-field size,  $\triangle I/I$  decreases as the size of the adapting field increases.

For a given brightness and constant adapting-field size, increasing the size of a very small test-field lowers  $\triangle I/I$ . For a moderately large test-field an increase in size has little effect on  $\triangle I/I$ . For a test-field almost as large as its adapting-field, an increase in size up to the limits of the adapting field may result in increases in  $\triangle I/I$ , especially at high adapting-field brightnesses.

The results are discussed in terms of a neural interaction hypothesis.

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## VERBAL CONCEPT FORMATION IN RELATION TO PERSONAL ADJUSTMENT

(Publication No. 2355)\*

Joseph Robert Sanders, Ph.D.  
Columbia University, 1950

Within a decade after Binet and Simon introduced the first objective tests of the development and intelligence in children, other workers were investigating the deterioration of intelligence in adults by objective methods. One facet of intelligence which has received considerable attention in these investigations of deterioration is concept formation.

A survey of the literature has revealed that previous clinical studies of concept formation have, almost exclusively, used hospitalized neuropsychiatric patients in the late stages of maladjustment as experimental subjects. The conclusions drawn from most of these studies suggest that certain tests of concept formation can serve to differentiate hospitalized neuropsychiatric patients from normal individuals. However, such special psychological tests are rarely needed for this purpose. On the other hand, they are frequently needed for differentiating ambulatory patients from normals.

It is possible that the conclusions drawn from previous clinical studies of concept formation hold for ambulatory neuropsychiatric patients. However, it seems wise to avoid generalizing from hospitalized to ambulatory patients until experimental substantiation of their similarity is obtained. Thus, the purpose of the present study is to explore the verbal conceptual thinking of a group of ambulatory neuropsychiatric patients by means of special tests.

The specific experimental group employed in the present study consisted of 51 maladjusted veterans accepted for out-patient treatment at a Veterans Administration Mental Hygiene Clinic. A control group, consisting of 51 adjusted veterans, was also employed in the study. None of the control subjects had ever received a neuropsychiatric diagnosis from a psychiatrist or sought treatment for a mental illness. Every control subject was matched with an experimental subject on the factors of age, education, and I. Q.

Wechsler's Similarities Test (Form I + Form II) served as the measure of verbal conceptual ability in the study. For each of

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the 24 items in this test, subjects are required to explain how two objects, for example an orange and a banana, are alike. Two versions of the Similarities Test, the Standard and the Revised, were administered as part of a test battery to all subjects in the experiment. While both versions are based upon the same items and scored according to Wechsler's rules, they are administered differently. Furthermore, in addition to being scored according to Wechsler's three-point scale, every response to the Revised Test is scored according to a seven-point scale and assigned to one of five type categories. Thus, while the Standard Test yields only measures of conceptual ability, the Revised Test yields measures of conceptual ability and conceptual type. These two tests of concept formation, the Standard and the Revised Similarities, were analyzed to determine: (1) whether or not significant differences exist between them, (2) whether or not either test can distinguish the group of maladjusted veterans from the group of adjusted veterans, and (3) whether or not either test yields variables which are significantly related to measures from the other tests in the battery — the Rorschach, Wechsler-Bellevue and Primary Mental Abilities. Following are the major results and conclusions which pertain to these three questions:

1. Comparison of the Standard and Revised Similarities tests reveals that significantly higher scores are obtained by the control and experimental groups on the Revised Test. The correlation between these scores from the Revised Test and measures from the two intelligence tests is consistently higher than the correlation between corresponding scores from the Standard Test and the same measures of intelligence. These results suggest that the changes in administration incorporated in the Revised Similarities Test tend to increase the test's validity as a measure of intellectual ability.

2. Measures of verbal concept formation were analyzed to determine whether or not they offer clues to the adjustment of veterans which cannot be gleaned from knowledge of their age, education, and I. Q. None of the measures of conceptual ability derived from either the Standard or the Revised Similarities Test succeeded in differentiating the two equated groups of veterans used in this experiment. This result leads to the conclusion that ambulatory maladjusted veterans matched, man-for-man, in age, education, and I. Q. with adjusted veterans will probably not show a relative deficiency in verbal conceptual ability as measured by the Similarities Test. In contrast to this conclusion, analysis of the verbal conceptual type measures suggests that equated groups of adjusted and maladjusted veterans may differ in the frequency with which they use various types of concepts to solve problems comparable to those found in the Similarities Test.

3. Highly significant correlations were found between every one of the Similarities measures of ability and each of the three variables from the Wechsler-Bellevue and Primary Mental Abilities. This finding attests to the close link between verbal conceptual ability and general intellectual ability. However, these same Similarities measures of ability yielded only tenuous relationships with three variables from the Rorschach which purport to reflect the habitual ways in which an individual thinks. In contrast to these tenuous correlations, the frequency with which subjects used "class concept" type responses on the Similarities Test was found to be very significantly correlated with the number of "whole" responses they gave on the Rorschach. Moreover, this same type of response was the only Similarities Test variable which yielded a significant correlation with the measure of "organizational tendency" obtained from the Rorschach.

#### THE RELATIONSHIP BETWEEN EXAMINER HOSTILITY AND SUBJECTS' RORSCHACH SCORES

(Publication No. 2443)\*

Richard Sanders, Ph.D.  
University of Michigan, 1951

The Rorschach Test is widely used as a measure of personality. However, there is little appreciation of the fact that the examiner's personality may influence the subject's Rorschach scores. Accordingly, the present study is concerned with two major problems: (1) whether different Rorschach examiners elicit characteristically different Rorschach protocols from their subjects, and (2) whether these differences in subjects' Rorschach scores are related to examiner personality variables. The first problem was investigated jointly with S. E. Cleveland. In the second phase of the study, the present author independently studied examiner hostility, and Cleveland investigated the Rorschach correlates of examiner anxiety.

Nine examiners were given a series of projective tests prior to the study and then trained to administer the Rorschach Test. They each administered the Rorschach Test individually to 30 different college students. Immediately after taking the test, each subject filled out a questionnaire designed to measure his feelings

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toward the examiner. The Rorschach records of the subjects were randomly assigned to two experienced clinicians for independent scoring.

The variances contributed by examiner differences to subjects' Rorschach scores, were analyzed for each of 40 scoring categories. Significant examiner differences were found for 20 of the scoring categories. Eight of these 20 scores are relatively independent of the general responsiveness of the subjects, and of each other. This number of significant differences is beyond chance expectancy and leads to a rejection of the null hypothesis that the Rorschach scores obtained by subjects of different examiners do not differ significantly.

The second phase of this study dealt with the relationship between the hostility of the examiners and the Rorschach protocols of their subjects. Hostility of the examiners was measured by scores derived from: (a) the questionnaire filled out by the subjects and (b) the examiners' Rorschach records scored by the Elizur procedure. The former is termed a measure of overt hostility, the latter, of covert hostility. These two measures correlate  $-.79$ . Comparison of the Rorschach protocols and questionnaire responds of subjects tested by examiners falling at the extreme of each of the hostility measures revealed that:

1. Seven of the subjects' Rorschach scores are significantly related to examiner hostility.
2. Compared to examiners perceived as least hostile, those who are described by their subjects as overtly hostile, are least preferred as "close friends." It may be inferred that subjects tend to "withdraw" from overtly hostile examiners. These examiners elicit Rorschach records which suggest that their subjects tend to behave passively, intrapunitively, and in a constricted fashion.
3. Examiners with most covert hostility are not described as hostile by their subjects. In fact, subjects express a desire to be closer to these examiners. The more covert the examiners' hostility, the less the Rorschach records of their subjects suggest passivity and stereotypy. On the basis of their Rorschach scores, subjects of covertly hostile examiners seem more free to indulge in hostile fantasies.



## THE SIGNIFICANCE OF IDENTIFICATION IN SHORT-TERM THERAPY

(Publication No. 2444)\*

Harvey Schrier, Ph.D.  
University of Michigan, 1951

This is a study during the course of short-term therapy of the relationships among Identification of patient with therapist, the amount of Positive Rapport between the participants, and the degree of Therapeutic Success. Identification is considered as the end-result of processes of introjection, and is defined as the introjection into one's own character-structure of traits and perceptions of another. Two types of identification are considered based on the type of content introjected: (1) "classical," involving the introjection of core traits of the other person, and (2) "syntonic," involving the introjection of perceptions and attitudes of the other person, limited in our study to a therapist's perceptions of a patient.

The hypothesis of this study asserts that a positive relationship exists among the three variables investigated. The approach involves the correlation of persons (Q-technique) in order that interrelationships between self- and other-ratings can be computed. The ratings by therapists, patients, and external groups of judges permit the assigning of ranks to patients on the variables of the hypothesis. Patients are ranked on Identification according to the magnitude of the appropriate correlations. For Therapeutic Success and Positive Rapport ranks are assigned on the basis of appropriate mean ratings of judges. Ranks represent the standing of the patients on the different measures of each variable. The concordance of these series of ranks, calculated with Kendall's Coefficient of Concordance among ranks ("W"), provides the test of the hypothesis. The research design permits the investigation of congruence between ranks of patients derived from internal data (the nuclear relationship of patient and therapist) and external data (outside groups of raters). The measures of the study involve self- and other-ratings on a Common Rating Scale, ratings from interviews with patients and therapists at the initial and final stages of therapy and ratings from case history data and therapeutic notes.

The results indicate that the ranks assigned to patients on

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Identification, Positive Rapport, and Therapeutic Success are concordant well beyond chance. Further, there is significant concordance between ranks of patients within the measures of internal and external data as well as between these sets of data. The greater stability of classical over syntonic identification is shown (as predicted in our theory), and the interrelationships between both types of identification and high- and low-ranking cases is discussed. Differentiating characteristics between high and low cases are examined.

Theoretical inferences from the data are that Identification is basically founded on the ability to form emotional relationships with others, as Freud originally indicated. Successful therapy implies a modification in character-structure which is partially dependent on the types of identifications a patient makes in therapy. The prime focus of therapy, therefore, becomes the inter-individual relationship between the participants and the ability of the patient to utilize the therapist's personality as a reservoir of identifications. The theory of identification and its crucial role in the development and modification of character are stressed throughout.

#### THE ROLE OF SUCCESS AND FAILURE IN DETERMINING ATTITUDE TOWARD THE GROUP AS A MEANS TO MEMBER GOALS

(Publication No. 2462)\*

Harry P. Shelley, Ph.D.  
University of Michigan, 1951

Groups may provide a means for the satisfaction of certain needs of their members. To the extent that a group mediates (serves as a means) to goals common to its members, the members develop a positive Attitude Toward the Group As a Means to Their Goals. This is a study of the relationship between:

1. The success or failure of experimentally created groups to solve problems common to all the members of the group and member Attitude Toward the Group As a Means to Member Goals.

2. Attitude Toward the Group As a Means to Member Goals and (a) member rating of the Quality of the Group's Decision, and (b) member rating of his Satisfaction with that Decision.

Groups of four, composed of volunteers from psychology

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courses, were given a series of five puzzles to solve. The success of the group in solving the problems was manipulated by the introduction of a trained assistant as the fifth member of each group, failure by the use of impossible standards as the criterion of success. Ratings on an eleven-point scale were obtained on variables relating to each member's Attitude Toward the Group As a Means to Member Goals, Need for the Other Group Members, and Personal Liking for each Group Member as well as judgments of the Quality of the Group's Decision and of Satisfaction with that Decision.

The members of those groups successfully solving the problems had a significantly higher positive Attitude Toward the Group As a Means to Their Goals than did the members of the groups failing to solve the problems.

The findings were equivocal with respect to member Perception of the Quality of the Group's Decision and member Satisfaction with that Decision. There is evidence that the predicted relationship between Attitude Toward the Group As a Means to Member Goals and (1) Perception of the Quality of the Group's Decision and (2) Satisfaction with that Decision was attenuated because the failure groups consistently perceived themselves as doing better on the last problem than they expected to do while the success groups perceived themselves as doing poorer than they expected to do. An attempt to control this confounding factor in a second experiment was unsuccessful. The success and failure groups did not differ significantly in Perception of the Quality of the Decision and Satisfaction with that Decision.

When the data in the second experiment were broken down according to the sources from which the volunteers were obtained, the predicted positive relationship between Satisfaction with Decision and Attitude Toward the Group as a Means to Member Goals was found in one sample and not in the other. There is reason for thinking that the two sets of volunteers differed in need achievement. If this evidence is accepted the results indicate that the predicted relationship is present in groups composed of members with high need achievement and not present in groups composed of members with low need achievement.

The research called attention to variables which must be taken into consideration in future theoretical formulations concerning Attitude Toward the Group As a Means to Member Goals.

## EXPERIMENTAL INDUCTION OF ANXIETY BY CONDITIONS OF UNCERTAINTY

(Publication No. 2465)\*

Awadh Kishore Prasad Sinha, Ph.D.  
University of Michigan, 1951

This investigation was made for the purpose of finding out whether anxiety can be induced by subjecting adult human beings to conditions which are to a sufficient degree phenomenally uncertain or indeterminate.

The following hypotheses were experimentally tested:

A. If uncertainty is introduced into a person's perception or expectation, or both, when such perception and/or expectation pertain(s) to a condition of sufficient importance, e.g., occurrence or non-occurrence of painful electric shock, a reportable state of anxiety will arise.

B. The anxiety state arising under the conditions stated in A will be accompanied by changes in respiration, apparent skin resistance and pulse rate.

C. The greater the uncertainty, the greater will be the anxiety reported and the greater the physiological changes.

There were four experimental sessions for each of twelve subjects. A form of continuous activity requiring a high degree of alertness, but offering a minimum possibility of improvement in performance beyond a short preliminary familiarization period was required of the subject.

The principal kinds of uncertainty were as follows: (a) uncertainty of time occurrence of a painful electric shock, when such shock was given immediately for each "error" in performance (this uncertainty is due therefore to the uncertainty of time of occurrence of an "error"); (b) uncertainty, presumably greater than that of (a), of time of occurrence of shock, when each shock was delayed 30 seconds; (c) uncertainty in the subjects' knowledge of occurrence of "error"; and (d) uncertainty of anticipation of the phenomenal qualities of shock.

These uncertainties were utilized in the four experimental sessions for each subject in such a way as to provide, so far as a priori considerations would indicate, four levels of situational uncertainty.

Continuous records were made throughout each experimental

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session of the subjects' apparent resistance levels (PGR), respiration, performance, and shocks. Pulse counts were made at roughly uniform intervals. At the end of each session the subjects were questioned about experiences of anxiety.

Results showed a high degree of correspondence between (a) levels of uncertainty, as defined *a priori*, (b) subjects' reported anxiety levels, and (c) levels of PGR, heart rate and respiration volume.

### RELATIVE PREDICTIVE EFFICIENCY OF MULTIPLE REGRESSION AND UNIQUE PATTERN TECHNIQUES

(Publication No. 2359)\*

Joseph A. Tucker, Ph.D.  
Columbia University, 1950

This investigation had a two-fold purpose. One was to investigate the relative predictive merits of the unique pattern and multiple regression techniques. The other was to investigate empirically problems associated with the use of the unique pattern technique. The most important of these problems was the investigation of the effect of changes in the size of the score axis upon the predictive efficiency of the unique pattern technique. Attention was given to the effect of differing criteria, predictor variables and samples upon both the multiple regression and unique pattern techniques.

#### Subjects

For the analysis using the pilot Graduation/Flying Deficiency Elimination criterion and selected variables from the Aircrew Classification Battery, 1570 pilot trainees were used. An analysis was made using this total group and another was made using just those trainees of the total group who had not had previous flying experience. For the analysis using the clerk-typist school Final Grade criterion and selected variables from the Airman Classification battery, 1204 Airman clerk typist trainees were used.

#### Procedure

For each analysis an Experimental sample and Cross-validation sample were used. The Experimental sample was used in developing beta weights for the multiple regression technique and unique pattern values for the unique pattern technique.

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These weights and values were applied to the scores of the subjects in the Cross-validation sample. The correlation between predicted score and actual score was then obtained. Comparison of the relative magnitude of the coefficients obtained by the two methods was made. Numerous test combinations were investigated. Since unique pattern values were obtained using varying units on the score axis, coefficients obtained using the different units were compared.

### Conclusions

The conclusions are now presented.

1. In general, the multiple regression method gave more accurate predictions than did the unique pattern method. However, the unique pattern technique did work very well as a predictive technique.
2. It was definitely determined that the limiting of the number of categories on the score axis not only did not cause loss of validity for unique pattern technique but actually resulted in an increase in validity.
3. It was found in this study that, in general, combinations of variables using a score axis that formed from 16 to 32 unique patterns gave the best predictive results. Very good results were obtained using as few as 9 unique patterns.
4. Though the unique pattern technique requires the use of large samples, these samples need not be as large as first supposed. Samples of 500 could be used in many cases.
5. In any given situation the multiple regression technique will show either greater or at least as much predictive stability as the unique pattern technique.
6. Predictor variables that were different as to psychological content gave the best predictive results for the unique pattern technique.
7. It was found that given a definite number of patterns there was less shrinkage and greater validity to be obtained by using a broad grouping on the score axis and more variables than could be obtained by a refined grouping on the score axis and few variables.



## PSYCHOLOGY, PATHOLOGICAL

### A STUDY OF RIGIDITY AND DISTORTION IN NORMALS AND SCHIZOPHRENICS WITH CONTROLLED VERBAL MATERIAL

(Publication No. 2336)\*

Murray Aborn, Ph.D.  
Columbia University, 1950

The basic purpose of this study was to investigate whether the often postulated tendencies toward rigidity and distortion in the behavior of schizophrenics could be detected with well-controlled verbal material. A Word Selection Test was constructed, in which some brief descriptions of hypothetical persons were followed by an adjective checklist. The checklist consisted of seventy-two words representing an adequate spread of trait-names among all areas of personality description and controlled for vocabulary level and the favorability or unfavorability of the traits involved. The checklist furnished a constant measure for the variables introduced by the descriptive "Stories," which were of several types. One set described the persons by using some of the trait-names contained in the checklist. A parallel set described the same persons without the use of any trait-names whatever. Some Stories were composed of all-favorable or all-unfavorable traits. Others were composed of various combinations of favorable and unfavorable traits.

Each subject was presented with some specific arrangement of Stories. After reading each Story, he marked those words of the checklist he thought would apply to the person described. In this way, subjects were required to reconstruct the descriptive trait patterns given from among the wide variety of discrete trait-names in the checklist. "Rigidity" and "distortion" were defined operationally, i.e., in terms of the variables provided by the testing instrument itself. Constriction in the size of the trait patterns returned was induced when their formation was made difficult by omitting the descriptive adjectives and by using both favorable and unfavorable traits in the Stories. Distortion was measured in terms of the consistency between the trait patterns given and the trait patterns returned.

The subjects used for the study consisted of an experimental group of eighty hospitalized, cooperative schizophrenics of above average intelligence and a control group of eighty normal

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persons. Both groups were equated in terms of age, sex, education, and level of intelligence.

The test was scored according to the number of adjectives marked on the checklists that fell into the following categories: those given in the Stories (no generalization), synonyms (some generalization, antonyms (distortion), additional adjectives consistent with the given (high generalization), and additional adjectives inconsistent with the given (distortion). A word-by-word analysis of the percentage of subjects responding to each word of the checklist for each Story was also made. Statistical treatment designed to bring out any reliable differences between the two groups was applied to the test results.

The findings were essentially negative, particularly with reference to any evidences of rigidity. The schizophrenics in this study reacted in a no more constrained manner than did the normals regardless of which test variables were introduced. The schizophrenics did manifest a greater tendency toward distortion of the given patterns, although in most instances such tendencies did not meet the statistical criteria of significance. In general, the schizophrenics were well able to deal with the kind of verbal concepts involved in the material used for this investigation and they seemed to grasp and perform upon the basis of the categorical features of the task.

In evaluating these findings, it might be noted that the schizophrenic sample was somewhat atypical with regard to their intact intellectual status. Aside from this limitation however, the results of this study indicate that some pathological phenomena supposedly characteristic of schizophrenics may not be experimentally verifiable when reduced to measurable variables and examined under controlled procedures, particularly if the instrument of investigation is such that it does not impinge upon the schizophrenic process.

## A STUDY OF THE FREUDIAN THEORY OF PARANOIA BY MEANS OF A GROUP OF PSYCHOLOGICAL TESTS

(Publication No. 2374)\*

Marvin Lucius Aronson, Ph.D.  
University of Michigan, 1951

### A. Problem

The Freudian theory of paranoia maintains that homosexual conflicts are at the root of most cases of paranoia. In this study, a number of predictions of the Freudian theory of paranoia were tested by means of a battery of psychological instruments, each of which attempts to tap certain aspects of homosexual conflict (or more broadly, psychosexual disturbances).

### B. Problem

Thirty subjects were selected for each of the following three groups on the basis of the extent to which they showed paranoid delusions: (1) Paranoid Group, (2) Psychotic (non-paranoid) Group, and (3) Normal (non-institutionalized) Group. All three groups were equivalent for age, education, intelligence, occupation and religious affiliations. The two psychotic groups were equivalent for the length of time they had been in the hospital at the time of testing.

The three groups were compared on the following seven psychological tests:

1. Interest Scale of the Minnesota Multiphasic Personality Inventory
2. Ink Blots Exercise of the Terman-Miles Attitude-Interest Analysis Test
3. Franck-Rosen Masculinity-Femininity Test
4. Draw-A-Man Test
5. Rorschach Test
6. Testing of the Limits for Sex on the Rorschach
7. Blacky Pictures Technique

The general hypothesis was that the subjects in the paranoid group would show a greater incidence of homosexual conflicts (or psychosexual disturbances), as measured by each of the tests in the battery, than would the subjects in either of the other groups.

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### C. Results

Test 1 The paranoids obtained significantly higher femininity scores than the normals, but they did not differ significantly from the psychotics.

Test 2 The paranoids obtained more feminine scores than either of the other groups did.

Test 3 No significant differences were obtained.

Test 4 Reliability of ratings of homosexual conflict was too low to permit the use of this instrument as a test of the Freudian theory.

Test 5 The paranoids gave significantly more "homosexual" responses than did subjects in either of the other groups.

Test 6 The paranoids showed significantly more preoccupation with percepts of male genitalia than either of the other groups did.

Test 7 The paranoids showed greater evidence of disturbance than the normals on the following Blacky "dimensions": Oral Eroticism, Oral Sadism, Anal Retentiveness, Masturbation Guilt, Castration Anxiety, Identification Process, Internalized Guilt Feelings, Narcissistic Love Object, and Anacletic Love Object. The paranoids were more disturbed than the psychotics on the dimensions of Anal Retentiveness and Internalized Guilt Feelings.

### D. Conclusions

Many predictions of the Freudian theory of paranoia were supported by the results of this study. This agreement between empirical testing findings and predictions of the theory was particularly impressive in view of the fact that none of the tests in the battery was designed for measuring the specific kinds of homosexual conflicts which the Freudian theory maintains are instrumental in the etiology of paranoia.



## A FACTORIAL STUDY OF INTELLECTUAL FUNCTIONING IN NORMAL AND ABNORMAL ADULTS

(Publication No. 2338)\*

Abraham Barnet Brody, Ph.D.  
Columbia University, 1950

An attempt was made to obtain information concerning the structure of intelligence in normal and abnormal subjects by means of a factor analysis of a battery which included several widely used clinical tests. The study investigated three areas: Is it possible to differentiate normal from abnormal subjects on the basis of the derived factors? Can a factor of conceptual ability be derived from the battery? To what extent do certain Rorschach variables measure factors which are also measured by tests of intelligence?

The subjects were 51 pairs of white, male veterans of World War II; matched as to age, education, and I.Q. The experimental member of each pair was a patient in therapy at a mental hygiene clinic, and the control member had no obvious signs of needing, or wanting, psychiatric care.

The 102 subjects were given the following battery of tests:

The Wechsler-Bellevue Intelligence Scale (WB)

The SRA Primary Mental Abilities Test (PMA)

The Rorschach

The SRA Identical Forms Test

Three experimental tests designed to measure conceptual ability.

From this battery 40 variables were selected. These included all sub-tests of the WB and the PMA, certain Rorschach variables, a score from the Identical Forms Test, and one score from each of the tests of conceptual ability. Since it was desired to use the total group of 102 subjects as the source of the intercorrelations to be computed, a dichotomous variable indicating membership in the experimental or control sub-group was also included.

All the intercorrelations among the 40 variables were computed. The 25 most significant variables were then selected, and this 25 variable matrix factored. Thurstone's centroid method was used, and four factors were extracted. These factors were rotated to produce the following structure:

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Factor A had high loadings on tests of verbal and reasoning ability. It was unrelated to adjustment, but had appreciable loadings on certain Rorschach scores. The factor was designated a verbal-reasoning factor.

Factor B had high loadings on measures of adjustment, loadings in the direction of good adjustment on complex timed tests and on Beck's Z, and loadings in the direction of poor adjustment on the Rorschach variables of Movement and on the sum of color responses. The factor was designated an adjustment factor.

Factor C had high loadings on the WB performance tests, and on the space test of the PMA. It was designated a spatial-performance factor.

Factor D had high loadings on the verbal tests, and on the Rorschach variables, but the nature of the factor could not be determined.

The point biserial correlations of group membership and each of the other variables had been computed. Only one variable had significant correlation at the .01 level, and three at the .05 level. Since 39 correlations were obtained, these results might well have occurred by chance. Therefore, the individual variables used in this study were not able to significantly differentiate the two groups. The variable which was significant at the .01 level was the Munroe Adjustment Rating. This suggests that check lists which enable many diagnostic indicators to be combined into a single score may be a more fruitful source of study than individual variables.

Factor B is clearly related to personal adjustment, and yet has large loadings on tests of intellectual abilities. This indicates the need to consider the non-intellectual aspects of personality when evaluating performance on intellectual tasks. Scores on a test of intelligence are attained by an individual functioning as a whole, and all facets of his personality must be considered if his intellectual performance is to be properly evaluated.

# THE PRE-RECOGNITION RESPONSES OF SCHIZOPHRENIC PATIENTS AND NORMALS IN A WORD ASSOCIATION TEST

(Publication No. 2353)\*

Joseph Edward Ressler, Ph.D.  
Columbia University, 1950

The study is concerned with: (1) the effect of emotional value on pre-recognition responses to tachistoscopically presented materials (Rapaport's revision of Orbison's list of traumatic and non-traumatic words) and (2) the application of pre-recognition responses to the problem of quantitative differentiation between groups of individuals with differing degrees of normalcy.

Subjects were twenty ambulatory paranoid schizophrenic patients and twenty normals matched for age, educational level, occupation, vision, and perceptual digit span.

Words were presented under controlled illumination conditions of increasing brightness until recognition occurred. Results were scored in terms of reaction time and the following categories of pre-recognition errors: similar structure, dissimilar structure, nonsense word, name of person, other name, no response, number of repetitions in sequence, total repetitions twice or more and total errors.

Results indicate that (1) certain categories of pre-recognition errors can differentiate between a group of schizophrenic and a group of normal subjects as well as between critical and neutral words; (2) reaction time is found to differentiate between the two groups with respect to recognition responses solely; (3) the technique of sub-threshold tachistoscopic presentation may be used successfully in place of the free association technique with advantages in objective scoring of response, control of physical stimulus, and observation of behavior prior to recognition.

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# AN INVESTIGATION OF DIFFERENCES IN INTELLECTUAL FACTORS BETWEEN NORMAL AND SCHIZOPHRENIC ADULTS

(Publication No. 2464)\*

James Solomon Simkin, Ph.D.  
University of Michigan, 1951

This investigation was concerned with the assumption that personality and intelligence are interrelated. The hypothesis used to test this assumption was: There are differences in the intellectual structures resulting from factor analyses of the Wechsler-Bellevue Intelligence Scale Form I Subtest scores of a group of normals and of a matched group of schizophrenics.

Two hundred subjects were used in this study. One group was composed of 100 hospitalized Unclassified Schizophrenic patients selected to meet certain criteria listed in the Veterans' Administration Technical Bulletin 10A-78. All were white, male veterans between the ages of 21 and 31. The second group consisted of 100 normal subjects, tested jointly with Gerald L. Hover who was conducting a parallel investigation with Psychoneurotic patients. The normal group was matched with the schizophrenic group for age and education. In addition to being white, male veterans, none of the normal subjects had ever been hospitalized or treated for mental disorders.

All subjects had been or were administered the Wechsler-Bellevue Intelligence Scale Form I. Correlation matrices were prepared for each of the two groups. Each correlation matrix consisted of the correlations of each of the 11 subtests with every other subtest. The matrices were factor analyzed using Thurstone's Complete Centroid Method and rotated using his Extended Vector Method. Two completely independent solutions resulted in essentially the same rotated factor matrices.

The resulting intellectual structure of the normal group included a general factor (mean variance = .34) loaded by all of the subtests; a verbal factor (mean variance = .09); a visual-motor factor (mean variance = .04); a factor tentatively designated as symbolic manipulation (mean variance = .03) and a unique factor (mean variance = .04) loaded only by the Digit Span subtest.

For the schizophrenic group the intellectual structure included a general factor (mean variance = .24) loaded by most of

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the subtests; a performance factor (mean variance = .12); a verbal factor (mean variance = .10); and a factor designated as concentration-speed (mean variance = .08).

It was concluded that there are differences in the intellectual structures of normal adults and schizophrenics matched for age and education. The intellectual structure of the schizophrenic group appears to be relatively differentiated as contrasted with that of the normal group which appears to be relatively integrated. On the basis of the above conclusions the assumption that personality and intelligence are interrelated is believed to be substantiated.

The diagnostic value of a scatter index and Wechsler's "pathognomic sign" for identifying schizophrenics was also investigated. Although there were differences in mean inter-test variability between the two groups, the scatter index failed to dichotomize individuals reliably. Wechsler's "pathognomic sign" also proved to be unreliable.

## PUBLIC ADMINISTRATION

### PROPERTY TAXATION IN VIRGINIA

(Publication No. 2320)\*

Vernon O. Johns, Ph.D.  
University of Kansas, 1948

As a permanent source of revenue, property taxation in Virginia dates from the Revolutionary War. At first only land and a very few items of personal property were taxed, but the base of the tax was eventually broadened and with the adoption of the Constitution of 1851, a general property tax came into existence. Property taxes now account for practically all county tax revenues and approximately three-fourths of city tax revenues. Approximately five per cent of state tax revenues come from property taxes.

Although it possesses some desirable features, the property tax system is defective in numerous respects. Many assessment districts are too small. The interassessment interval for real estate is far too long. Because reassessment of real estate is discontinuous, it is impracticable to maintain permanent assessment agencies. Consequently the reassessment of real estate is performed

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by court-appointed boards which serve only during the assessment year. Members of such boards have had little or no experience in assessment work. Practically no use is made of modern assessing aids. Fractional assessments magnify errors of judgment on the part of assessors. The result is wide-spread inequalities in assessments. Because taxpayers are, typically, relied upon to declare their personal property, much of such property escapes taxation or is assessed at only a fraction of its value. Public service corporation property is withdrawn from the local assessment and is assessed instead by the State Corporation Commission. But the unit method of assessment is not used and the basis for allocation of taxable values to the localities involves hardship for some, while benefiting others.

Except in a few localities, review of real estate assessments is performed by temporary boards, members of which are typically inexperienced. There is no independent review agency in the few localities which have permanent assessment agencies. There is no agency for the administrative review of assessments of mineral lands and personal property.

Collection procedures vary widely among the localities and there are wide variations in the extent of both short-term and long-run delinquency. The office of delinquent tax collector, found in about one-half the cities, reflects the laxity of collection procedures.

During the last few years an increasing number of localities have secured the assistance of appraisers, trained by the State Department of Taxation, in connection with their reassessments of real estate. The appraisers function as expert assistants to the local boards of assessors. Because the localities obtain such assistance voluntarily, effective cooperation between appraisers and the local assessors is assured. Ratio test studies reveal assessment inequality to be substantially less in localities which have secured such assistance, as compared to localities which have not utilized the services of appraisers. This important development may accordingly contribute to the solution of the problem of securing better local assessments not only in Virginia but in other states also where the strength of the home-rule tradition has prevented development of effective state supervision of the local assessment.

Segregation of real estate and tangible personal property for taxation by the localities exclusively failed to bring expected improvement in the local assessment. Whether or not segregation was a forward step is open to question.

Classification of property for purposes of taxation failed to produce expected increases in the assessment of intangibles. If the principle is to be retained, it might well be extended to land instead of being confined largely to intangibles as at present.



## SOCIOLOGY

### THE FORK IN THE ROAD: A STUDY OF ACCULTURATION AMONG THE AMERICAN KALDERAŠ GYPSIES

(Publication No. 2339)\*

Rena Maxine Cotten, Ph.D.  
Columbia University, 1950

This work is a study of the changes in American Kalderaš culture as a result of contact with the American culture. The study divides the course of culture-change into three periods. In the first period, from the time of arrival in the United States until 1925, there was a continuation of Kalderaš culture as it is practiced in Europe and in South America. During the second period (1925-1933), the band had permanent winter headquarters in a large city; gradually the patterns of pitching tents in an open-air camp disappeared, having been supplanted by the practice of stopping in cities or towns while on the road. It was during this intermediate period also that such items of material culture as tables, chairs, beds, and forks were adopted; however, even today, beds and chairs are luxury items, reserved for the use of important people.

The most basic changes occurred during the third period of acculturation, from 1933 to the present. The depression and the increasing industrialization of the United States caused the disappearance of a market for hand-made and hand-repaired copper articles. Loss of economic self-sufficiency forced the Kalderaš to remain in the large cities where they could request relief-funds. In the city, the Gypsies came under closer observation of non-Gypsies — neighbors, tradespeople, policemen, social workers, etc. — than ever before, and the Gypsies themselves became more familiar with the non-Gypsy way of life. Because of an accidental event involving their ruler, the Kalderaš of this study even lost their political organization for a time and were governed by another Gypsy group.

However, changes due to acculturation have not been as extensive as one might have anticipated. Various factors in this resistance to acculturation are explored, both with reference to the Kalderaš and to other peoples. Additional general statements, gleaned from other acculturation studies, are reviewed, and revised hypotheses are formulated on the basis of the materials in this study.

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**SUBURBAN COMMUNITY ORGANIZATION — INTER-GROUP  
AND INTER-PERSONAL RELATIONSHIPS**

(Publication No. 2354)\*

Norman R. Roth, Ph.D.  
Columbia University, 1950

The interest of the present investigation is to study suburbanization with special reference to community organization. The dissertation is oriented to the institutional life of the suburban community, particularly the rural type suburb. The relationship of the institutions to the interest groups resident in the community and their role in altering the pattern of community activity is analyzed.

One community, Rurbantown, was selected as the site for an intensive field study. This community has been undergoing the transition from a village-centered agricultural area to a rural suburban town in close proximity to a central city of approximately 350,000 inhabitants. The change is not complete and three population segments — old line village residents, farmers, and newcomers — can be recognized in the community.

The bulk of the data was derived from intensive, non-directive interviews with people intimately involved in the organizational life of Rurbantown. A mail questionnaire was distributed, also, to a randomly selected sample of the Rurbantown population for the purpose of soliciting responses about leadership patterns. For comparative purposes, material from the Connecticut suburbanization studies and the Michigan fringe investigations has been utilized.

The conclusions of the study can be divided into three groups, each relating to one of the major hypotheses. The first hypothesis is concerned with the existence in the community of different interest groups and their expectations of what is to be derived from life in a community. Three related general conclusions are:

1. The stage of suburbanization will have a direct effect upon how easily different groups may come together. Community tradition, the amount of existing organized activity previous to the arrival of the commuter population, and the occupational interests of the people are important.

2. The background of the people composing the suburban community is significant. Basic value systems become involved and

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people must have an opportunity for learning what ideas are possessed by other persons.

3. Assimilation will be facilitated when people look upon their place of residence as their community, and not merely regard the suburb as a convenient place to escape the complex life of the city.

The second hypothesis is concerned with the activity of some institution in the community assuming the responsibility for taking the initiative to bring together the different interest groups for resolving the existing tensions and conflicts. Two major conclusions derived are:

1. Time can eliminate most of the tensions which exist, but this method is costly. The acceptance of the responsibility by some institution to take initiative can greatly reduce the time involved.

2. The community should directly attack the problem of designating and planning for the type of community it hopes to become. A clear stand should be taken by the responsible authorities.

The third hypothesis is concerned with the accommodation which may follow any conflict situation and the role of leadership in the community. Three conclusions related to this hypothesis are:

1. Leadership patterns will change as dissatisfaction increases, but leadership patterns may alter through a recognition that different groups in the community have something vital to contribute to community life.

2. The familiarity of people in performing leadership functions, as members of either a rural or an urban group, will become expressed when the necessity arises for taking sides in a specific conflict situation.

3. The assimilation process will be enhanced in a suburban community when the different groups are living among each other and not divided into separate geographical sections of the town.

Much is known about the suburban community, but there are many unsettled issues demanding the attention of additional investigation. As metropolitan and regional planning programs gain in popularity, and efforts are advanced for the decentralization of the central city, the position of the suburban community will necessitate increased consideration.

## THE ROLE OF THE SUN DANCE IN NORTHERN UTE ACCULTURATION

(Publication No. 2347)\*

John Alan Jones, Ph.D.  
Columbia University, 1950

The problem of this thesis is to determine what role the Sun Dance has played in Northern Ute culture. The Sun Dance has been selected as a focal point from which to discuss Northern Ute culture because it is now the principal, vital native feature remaining. Its adoption in 1870 marked a period of culture strain. From that time, attitudes and values of the old culture were attached and integrated into the ceremony until now, in another period of culture strain, the Sun Dance has become a symbol of revivalism. It is apparent, therefore, that the history of the Sun Dance among the Northern Ute is essentially the history of the Indian-White contact, and the social, economic and political insecurities which have arisen among the Ute from this contact.

The thesis is divided into four sections. The first section serves to identify the Northern Ute bands that were involved in the Indian-White contact situation. The second section deals with the cultural background of these bands, and is organized into five historic periods. These are the pre-horse, the post-horse and pre-White contact period, the White contact period, the reservation period, and the reorganization or modern period.

The third section discusses the Sun Dance in the light of the cultural background, and suggests a functional explanation for the adoption and retention of the Sun Dance in Northern Ute culture. The concept of need as interpreted in this thesis is primarily economic in cause. Thus the need which it is the function of the Sun Dance to fill may be described as a need for the alleviation of the insecurities which beset the Northern Ute as a result of their insecure economic organization.

Part four contains the conclusions reached in the thesis, along with suggestions for further research. It is concluded that the Sun Dance was adopted in the function of a War ceremonial in response to pressure from the newly arrived White settlers. When the Northern Ute war pattern was broken by the Whites, the dance was retained and became an annual ceremony in which individuals sought individual benefits in the form of supernatural cures, or curing

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powers. This element is still retained in the present form of the dance.

Interest in the Sun Dance has grown in recent years as the frustrations inherent in the acculturation process have become crystalized around it. The Sun Dance has become the symbol of the old, native culture, and its annual performance serves to unite the Northern Ute in common action expressive of their common attitudes. These attitudes are shared by those, usually full bloods, who identify themselves with Indian culture, but is rejected by those, usually mixed bloods, who wish to become identified with White culture. This factionalism is a disruptive influence, and threatens to cause further cultural disintegration.

The government policies towards the Northern Ute are reviewed in this section, and an analysis of the effect of these policies is offered. In particular, the present policy of economic collectivism is criticized as unrealistic in the face of the native values surrounding individualism which have always been important in Northern Ute culture, and which still survive.

It is suggested that further research should be done on revivalistic-nativistic movements. These movements are a reaction against a dominant culture by a suppressed one, and are particularly interesting due to world conditions today. Where these movements arise will be found economic, social, and political insecurities among the participant group, and in the proper understanding and alleviation of these insecurities lies a possible solution to many contemporary problems.

#### THE RENASCENT JEWISH NATIONALISM: A STUDY OF ITS LEADING CONCEPTS AND PRACTICES

(Publication No. 2369)\*

Fred Krinsky, Ph.D.  
University of Pennsylvania, 1951

No specific series of events or given era of historical time can be cited as the exact point of origin of a reborn Jewish nationalism. Perhaps the most significant conclusion reached as a result of this study is the apparent prevalence of strong nationalist feeling among the Jewish masses ever since the dispersion from Palestine in 70 A.D. This nationalism assumed many forms. There were times

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when it reached heights of activity, and there were periods when it was almost dormant. But it was always present.

Though religion was the soil that nurtured the love of Zion, to draw too sharp a line between people and faith in the Zionist conception of traditional Jewry is to perform an injurious operation on the body of a simple, loving idea. Grief over the glory that has departed, faith in Israel's vocation, and a stubborn yearning for earthly peace, security and dignity cannot be separated in the older religious conception of Jewish fate. Beneath the shell of Jewish theology and ritual was always hidden a profoundly human longing for roots, for soil, for order — for home. For the Jew, Palestine always remained the center of the Diaspora. It was not merely the country of tradition and dogma; for him it was the home and the mother earth of the Jewish people.

The immediate stimulus to the growth of modern Jewish nationalism was the Diaspora with its political and economic insecurity, its spiritual and emotional maladjustments, its pogroms and expulsions. However, there was no simple, casual relationship between Jewish misery and Jewish redemption. It was the national memory of the distant past, which remained alive even in modern times among the Jewish masses in Europe, that gave the builders of the new Zionist state a vision and a goal. Like all creative social movements, Zionism was more than a rational plan for the implementation of easily definable ends. It was its vision of the oneness of yesterday, today and tomorrow which aroused in the Jewish masses a new will to live and be reborn. Palestine was the locus of that vision. It was Palestine, the concrete symbol of historical continuity, which made it possible to transform the dormant energies of the Jewish people into a national will capable of removing great obstacles and shaping new realities.

When the converging forces of a growing continental nationalism and a renewed frenzy of anti-Semitic activity were unleashed upon Europe in the late eighteenth century, it seemed almost natural for the bulk of European Jewry to look to Palestine as its sole salvation. Under the leadership of a small but highly influential group of Russian and Viennese intellectuals, the theory of a return to Palestine was soon transformed into an active undertaking. Colonization was the outstanding characterization of modern Jewish nationalism. In five great waves of immigration, the Jews of Europe and elsewhere descended upon the Holy Land and turned it into a living, thriving society. Particularly noteworthy was the concomitant establishment of the new social and political forms — the kvutza and the moshav.

Beginning with Herzl and culminating in the establishment of the State of Israel, the political tribulations of the Zionists have been many and varied. Though generally in agreement on what

constituted the ultimate goal of the Jewish nationalism — namely, the rebirth of Israel — the specific ideologies which arose in the long struggle for achievement were numerous and often unique. Much of the controversy is still reflected both in the political parties of the new state and in the attempts to solve the problems confronting the infant state.

**THE ROLE OF THE FATHER IN THE FAMILY  
FATHERS' EXPRESSED ATTITUDES AND OPINIONS WITH  
REGARD TO THEIR ROLE IN FAMILY LIFE AND THE  
RESPONSIBILITIES, SATISFACTIONS AND PERPLEXITIES  
WHICH FATHERHOOD ENTAILS**

(Publication No. 2358)\*

Ruth Jacobson Tasch, Ph.D.  
Columbia University, 1950

This study was designed to obtain information concerning the role of the urban father in the family based on his own report. The basic data consists of fathers' reported activities, satisfactions and problems, and concept of the paternal role. Eighty-five fathers of diversified backgrounds, having 160 children, 80 boys and 80 girls, and all resident in the Greater New York City area, were the subjects.

The flexible interview method was used. Categories were empirically established for reported activities and concept. Those previously devised by Jersild and associates were utilized for satisfactions and problems.

A functional approach to the father's role was assayed. Functions implicit in reported activities, satisfactions and problems were compared with those explicit in stated concepts. A good deal of consistency was revealed. The paternal functions given greatest emphasis on the conceptual level were: Guide and Teacher, Economic Provider, Companion, Authority, and Child Rearer.

However, certain inconsistencies were found: use of an arbitrary approach in routine daily care and use of physical punishment in discipline were reported by many of the same fathers who expressed preference, on a conceptual level, for the democratic approach. Here is an area to which parent educators might profitably direct attention.

Analysis of activities in terms of age and sex of the children

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\* Microfilm copy of complete manuscript of 241 pages, \$3.01.  
Enlargements 6" x 8", 10¢ per page. Library of Congress  
Card Number Mic A 51-102.

indicated that the position of an activity category (such as one concerned with the child's intellectual development) remained fairly consistent from one age level to another even though some changes were noted (decline in mention of routine daily care; increase in mention of assignment of chores; going to the movies.) There seemed to be more similarities than differences in fathers' reported activities with boys and girls. However, differences were noted in routine daily care (more frequent mention for girls) and motor activities (more frequent mention for boys). At the three, four and five year old age levels, analysis of motor activities indicated that there was about as much mention of participation with girls as with boys. Thus, the decline in participation with girls in motor activities appears to follow the preschool period. This suggests that in the area of motor activities, at least, father is sex-typing both preschool boys and girls.

Practically all the fathers mentioned participation in those activities which contained instructional elements. In attending to the routine daily care and discipline of children, fathers infrequently reported use of the "instructive" and "reasoning" methods.

Companionship with their children ranked highest in fathers' reported "satisfactions," while Routines had a similar rank in reported "problems." Comparison of fathers and mothers in these areas indicated somewhat more similarities than differences. It is suggested that the differences (fathers appeared to appreciate the child more for himself, while mothers were more interested in his relations with others) may, in part, be attributed to the father's daytime absence from the home due to occupational necessity.

The over-all picture which emerges suggests that:

1. What fathers report that they do with and for their children seems to bear some correspondence to what they think a father should do.

2. The role of the fathers of this study appears to be an active one rather than "vestigial." Not only do they mention considerable participation in the routine daily care of the child, but the majority seem to consider child rearing as part of the requirements of the father role. This interpretation is suggested by the emphasis which fathers give to this function in advice to prospective fathers.

3. In addition to the evidence cited above, the fathers' reports contained infrequent mention of the grandfather generation as child rearers. There were indications also that the fathers of this study were relinquishing the patriarchal prerogative by sharing discipline with the mother. From this, the writer infers that there appears to be a changing pattern of paternity in the direction of a more equalitarian relationship.

ELECTROCHEMISTRY OF SOIL COLLOIDS

I. HUMUS

(Publication No. 2331)\*

Narayan Patnaik, Ph.D.  
University of Missouri, 1951

The object of this work was to study the electrochemical properties of humic substances and their more important subfractions obtained from soils. Comparative study of these substances with the total soil and the corresponding clay fraction was also carried out.

For the purpose, two differently developed soils were chosen to procure the humic materials: (1) Wisconsin peat and (2) Kansas Chernozem. The humic substances were extracted with  $N/2$   $Na_2CO_3$  at a pH below 10. Humic acid (alcohol-insoluble) and humatomelanic acid (alcohol-soluble but benzene-insoluble) were fractionated and purified. Alkali-extracted but unfractionated material was taken as crude humic acid. The whole peat from Wisconsin, and Kansas Chernozem and its clay were taken for comparative studies. All of them were electrodialyzed to obtain the respective hydrogen systems.

Potentiometric titrations with KOH, NaOH,  $Ca(OH)_2$  and MgO were carried out and the cationic activities of the corresponding series were measured by non-selective clay membrane technique developed by Professor C. E. Marshall and his associates. From the activity data, fraction active percentages and the cationic mean molar free bonding energies were calculated.

The titration studies indicate that all the humic systems, in general, show less buffering action with monovalent cations than with divalent ones. The inflection point in the neutralization curves with divalent cations occurs at a lower pH (7.5) but with higher amounts of base, whereas for monovalent cations it occurs at a higher pH (8.8) and with lower amounts of base. The base exchange capacity, as found at the point of equivalence, of the different humic substances falls in a general order of humic acid > crude humic acid > humatomelanic acid. However, the values of base exchange capacity for the humic materials varies a great deal as to the source. For example, humic material extracted from Wisconsin peat has b.e.c. value of about 300 m.e.%, whereas corresponding

\* Microfilm copy of complete manuscript of 143 pages, \$1.79. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-77.



values for materials extracted from Kansas Chernozem are near 400 m.e. %.

Cationic activity data show a greater ionization in the case of humatomelanic acid systems than in either humic acid or crude humic acid systems. The general order of ionic activity for different cations in all the systems is  $K > Na \gg Ca > Mg$ . The ionization of  $Ca^{++}$  from Ca-systems in the alkaline range does not increase appreciably with the increase of the added base. This suggests the formation of a very insoluble compound or a possible occlusion effect due to the aggregates which reduced the activity of the cation. The higher ionizability of the associated cations from the humates than from clays is of interest in the study of plant nutrition. Unlike clays, humic substances exhibit specific reaction with different cations and thus it is difficult to find any simple relationship between the activities of monovalent and polyvalent cations. Calculated fraction active percentages for different humates are significantly higher than those for clays; consequently, compared to clays, humic substances have lower mean free bonding energy of cations.

The effect of dilution on the Na-systems of crude humic acid (Wisconsin peat) shows weak acid character. The pH curves are not affected appreciably by dilution but there is some effect on the ionization of  $Na^+$ .

In general, the properties of crude humic acid are dependent on its components. Usually humic acid, being present in higher amounts, dominates the nature of crude humic acid. The electrochemical properties of whole peat, when considered on an ash-free basis, correspond closely with those of crude humic acid extracted from it.

From the data obtained for Kansas Chernozem and its clay and crude humic acid, it may be concluded that the interaction between the clay and humus tends to reduce their individual reactivity.



## SPEECH

### A COMPARISON OF NATIVE AND ACQUIRED LANGUAGE INTONATION

(Publication No. 2396)\*

John James Dreher, Ph.D.  
University of Michigan, 1951

This is a study to compare the intonation curves of ten representative simple statements and ten simple questions and their translations in Chinese. In addition to a part-for-part comparison of the sentences, the deviations in intonation by the group speaking an acquired language are examined in the light of the group's performance in equivalent speech-segments of its own language. On this basis an explanation by perseveration is offered.

Ten Chinese-speaking American and ten English-speaking Chinese informants were used. A series of questions was played to each subject from a constant-speed turntable. The test utterances, given by the subjects in answer to these questions, were recorded on magnetic tape. These responses were fed into the sound spectrograph, a 300 cycle and a 45 cycle pattern being made of each. The patterns were analyzed into segmental comparison units, fundamental pitch and time of units being recorded. These values were graphed for each group's performance in each utterance. Segmental units were tested for difference in time and pitch change by Student's "t".

The results show a significantly shorter time of response at the 5% level for the group using its native language. Some evidence is adduced to show that subjects use a higher mean pitch level when asking questions than when making statements and that this phenomenon appears when using either language. Directional agreement of comparison units indicate that both languages use certain definite pitch sequences in statement and question.

General conclusions are that subjects when speaking an acquired language strongly tend to match the intonation pattern set up by the native group, that they will make the same response in a significantly longer time, and that deviations from the pattern set up by the native group can be explained largely by a different intonation employed in an equivalent segment in the native language.

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\* Microfilm copy of complete manuscript of 227 pages, \$2.84. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-140.

# THE INDEX RHETORICUS OF THOMAS FARNABY

(Publication No. 2437)\*

Raymond Ernest Nadeau, Ph.D.  
University of Michigan, 1951

This thesis is a study of the Index rhetoricus of Thomas Farnaby (1575?-1647), a schoolmaster and rhetorician of the English Renaissance.

The study first undertakes the translation (from Latin and Greek into English) of the second edition of 1633, the first text to include the Formulae oratoriae by the same author. The thesis then attacks the problems of (1) a determination of the sources of the rhetorical theory and practice as presented in the Index rhetoricus, (2) a comparison of the work with contemporary Latin rhetorics in use in England during the first half of the seventeenth century, and (3) a survey of specific influences on later works and of influences in general.

A basic result of the study is the English translation, which is now available to students of rhetoric for the first time.

Conclusions of the study are as follows:

I. The primary and immediate sources of the Index rhetoricus are found to be the Commentariorum rhetoricorum. . . libri vi (1605) and the Rhetorices contractae (1621) of Gerardus Vossius, the Systema rhetoricae (1606) of Bartholomaeus Keckermann, and the Institutio oratoria of Quintilian. The secondary and ultimate sources, excluding the above writers, are found to number fifty-nine, among whom Aristotle and Cicero stand out.

II. Comparison with contemporary Latin texts in use in English grammar schools during the first half of the seventeenth century reveals that the Index rhetoricus met serious competition in the content and popularity only from Charles Butler's combined works, Rhetoricae libri duo (1598) and Oratoriae libri duo (1629).

III. Specific influences of the Index rhetoricus are largely confined to style in the rhetorical works of Alexander Gil, John Smith, Thomas Stephens, and John Sterling. Less obvious influences in other areas may be seen in the rhetorics of Thomas Horne and William Walker. General influences are assessed in the light of (1) eleven English editions from 1625 to 1704, (2) four continental editions from 1643 to 1672, and (3) evidence of the use of the work in Colonial America.

\* Microfilm copy of complete manuscript of 597 pages, \$7.47. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-181.

The appendices to the study include (1) commentaries on, and translations of, the copyright, dedication, introduction, and Formulae oratoriae, all of which are a part of the 1633 edition; (2) an essay on Thomas Farnaby as a schoolmaster, classical scholar, and writer of other textbooks.

A COMPARISON OF ELECTRO-CUTANEOUS  
DIFFERENTIATION OF VOWELS THROUGH A  
1-ELECTRODE AND 2-ELECTRODE SYSTEM

(Publication No. 2438)\*

Max Nelson, Ph.D.  
University of Michigan, 1951

This study is an introductory part of a long time program designed to develop the potentialities of cutaneous reception of speech. The ultimate objective of this program would be a small instrument that could be worn or carried. It would be similar to a hearing aid. However, in addition to amplifying sound, it would transduce sound to cutaneous stimuli.

The purpose of the experiment itself is to determine the effectiveness of differentiating vowel sounds cutaneously by means of electrodes and to compare a 1-electrode transducer with a 2-electrode transducer.

Ten normal hearing subjects underwent a series of twenty tests each. An aggregate of two hundred tests, comprising eighteen thousand combinations of vowels was administered throughout the experimentation. Each test was made up of two vowel sounds which had been compressed and were subjected to controls of duration and intensity. The two vowels in each test were presented in random order for a total of ninety combinations. The subjects made a judgment of same or different on each combination. Each subject used the 1-electrode system ten times and the 2-electrode system ten times.

The results indicate that real differences exist between the 1-electrode and 2-electrode systems on many tests. These differences point to the superiority of the 2-electrode system. Individuals show a range of differences in their response to this method of stimulation. Furthermore, subjects attained significantly higher test scores with the 2-electrode system than they did with the 1-electrode system.

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\* Microfilm copy of complete manuscript of 68 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-182.

The general conclusion is that the 2-electrode system is superior to the 1-electrode system for the cutaneous differentiation of controlled vowel sounds. Real differences exist between individuals in the way they respond to the electrode systems. Subjects attained higher scores through the 2-electrode system than they did with the 1-electrode system. These findings indicate that within the confines of the present study it is possible for most normal hearing subjects to differentiate controlled vowel sounds cutaneously.

## THEATER

### A HISTORY OF THE THEATRE IN ANN ARBOR, MICHIGAN, FROM ITS BEGINNINGS TO 1904

(Publication No. 2379)\*

Clara Marie Behringer, Ph.D.  
University of Michigan, 1951

This study traces the evolution of legitimate theatre in Ann Arbor from the founding of the town in 1824 to the closing of its single opera house in 1904. The scope of the study is comprehensive in respect to the city of Ann Arbor. It embraces the various theatre forms — plays, vaudeville, musicals, and opera. It includes one-act as well as full-length plays. It explores the total theatre scene, professional and amateur.

Ann Arbor newspapers supplied the single most valuable source of material. Generally speaking, the more than twenty thousand issues perused constitute a complete record of the period. Some portions of the eight decades are covered by as many as seven simultaneously published journals. Manuscripts, printed records, and interviews, plus secondary sources, augmented the newspaper material.

The results of the investigation answer three questions:

- (1) What are the facts that comprise the theatre history?
- (2) What can these facts reveal about the state of the theatre?
- (3) What can these facts reveal about the extra-theatre aspects of life? Volume II, a chronological account of performances, partially answers the first question by stating the known chartable facts: dates, titles, authors, composers, companies, directors,

\* Microfilm copy of complete manuscript of 604 pages, \$7.55. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-123.



producers, designers, place, time, admissions, actors, and roles. Unchartable facts, as well as answers to questions two and three, are in Volume I. Each chapter includes seven major divisions: physical theatre, drama, related dramatic types, management, actors, amateur theatre, and social history. The last-named discusses townspeople, economy, city government, puritanism, transportation and communication, and the University.

The study shows theatre as one of the most revealing facets of community life in Ann Arbor and points to the following conclusions:

(1) The history of the theatre for the town's first eighty years is cyclical in nature. It passed through the following stages: (a) amateur production, (b) exploratory professional forays, (c) performances by touring companies of a calibre of production identical with that displayed in metropolitan centers, (d) performance by touring companies of productions which evidenced a gradual decline in quality, (e) a return — albeit temporary — to amateur production.

(2) The physical theatre was the most potent factor in determining the number and calibre of productions.

(3) The drama presented was largely romantic with occasional treatment of contemporary subjects and "problem" themes.

(4) Related dramatic types such as variety, minstrels, opera, made up an important part of the theatrical fare. Opera was especially popular in Ann Arbor.

(5) A short period of non-local management of the opera house established Ann Arbor as part of the "road"; C. J. Whitney of Detroit operated it as one of his chain of theatres.

(6) Romanticism progressively tempered by realism characterized the acting style. Ann Arbor contributed twelve persons to the ranks of professional actors.

(7) Prolific production by amateur groups attests to a need for self-expression; there was no correlation between amateur production and the quantity of available professional entertainment.

(8) Correlation between the national economy pattern and the local theatre scene was negligible.

(9) The theatre reflected the community's growth, its tastes, customs, and attitudes. Especially pronounced were the evidences of puritanism and of a militant paternalism toward the University.



# THE ENTREMES, SAINETE AND LOA IN THE COLONIAL THEATER OF SPANISH AMERICA

(Publication No. 2426)\*

Anthony Michael Pasquariello, Ph.D.  
University of Michigan, 1951

The theater played a role in the religious, cultural and social life of colonial Spanish America no less important than in Spain. With few exceptions, the plays performed in the New World were Peninsular. It is precisely this search for exceptions which draws our attention to the brief one-act sketches called entremeses, sainetes and loas, composed by local artists. The forty odd pieces uncovered in the archives and published since the turn of the present century are sufficiently varied and representative for a more general and thorough examination than has hitherto been attempted of the contribution made by this minor dramatic genre to colonial life and letters.

The entremeses are studies chronologically under three distinct headings: 1. THE INTERLUDE AND THE CHURCH; 2. THE INTERLUDE AND THE BAROQUE SECULAR THEATER; 3. THE INTERLUDE AFTER CASTILLO. Within the first category fall the interludes of the Mexican dramatist, Fernán González de Eslava (1534-1601?), and the single entremés by the Dominican clergyman Cristóbal de Llerena (1550-1627?). These pieces are both didactic and satirical. They were intercalated in religious spectacles viewed on the church altars and in the monastery schools established for Indians. When the excursions toward lewd realism increased out of all proportion to the religious teaching, dramatic functions were driven out of the church buildings and into the vice-regal courts and public corral theaters.

From the church, the interlude passed into the aristocratic household or society. The between-act pieces of the Mexican nun, Sor Juana Inés de la Cruz (1651-1695), and the Peruvians, Juan del Valle y Caviedes (1652-1696), Pedro Peralta y Barnuevo (1663-1743) and Don Jerónimo de Monforte y Vera (16?-17?), sought to remold the interlude into something nearer their ideal of a civilized and creative society. The preferred pattern was the musical allegorical interlude steeped in the dregs of an illusive baroque expression.

The blind Peruvian clergyman, Fray Francisco del Castillo

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\* Microfilm copy of complete manuscript of 216 pages, \$2.70. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-170.

(1716?-1770), is regarded as the symbolic transition figure between the baroque age and the period of popular expression. While he imitated extensively the structure, and stylistic mannerisms of his predecessors, his interlude, Entremés del justicia y litigantes, was conceived in its original sense: a little play about little people and little things presented with a little touch of irony. By the close of the eighteenth century, the pattern set by Castillo was enthusiastically emulated by the Mexican dramatists, José Agustín de Castro (1730-1814), José Macedonio Espinosa (17?-18?) and Manuel Borla (17?-18?).

No such variety of expression characterizes the loas, or laudatory prologues. Consequently, they are studied chronologically in a separate chapter. From the sixteenth through the eighteenth century, their unctuous and mechanical expression became progressively more entangled within a maze of conceits, glittering metaphors and ambitious affectation of classical and mythological allusions.

Although the eighteenth century sainetes were a natural offspring of the entremés, they merit separate consideration since they were not always performed as interludes. The River Plate region contributes the only extant published specimens of the genre: the anonymous El amor de la estanciera, and El examen de los sainetes, and Cristóbal de Aguilar's (17?-1828) Venció al desprecio el desdén. The sainete alone of Spain's national dramatic forms survived the impact of the Creole upheaval in the nineteenth century.

The New World entremesistas and sainetistas were among the first colonial artists to become conscious of the existence of a collective culture peculiar to America. They wrenched comedy free from the classical limitations of an imported culture and used it to amuse and portray the society about them. With the exception of Sor Juana, there was no writer who possessed any element of greatness, of independent and self-contained permanence. But collectively they realized their mission well by first learning the lessons the Old World had to teach, then catching the spirit of the new national life and transmitting to their successors in a practical working form what they had learned from unaided experience. It mattered little whether their own works endured or not.

QUANTITATIVE ANALYSIS OF THE RESULTS OF THE  
ENZYMATIC DIGESTION OF NUCLEI

(Publication No. 2326)\*

Jay Barton, II  
University of Missouri, 1951

The problem with which the dissertation is concerned is the question of the nature of the inter-molecular associations of nuclear components. Specifically, the work was an inquiry into the nature of the bonds between desoxyribonucleic acid and the basic protein moiety of the cell nucleus. An approach to the problem was made by the observation and measurements of the enzymatic hydrolysis of chromosomes and nuclei by DNase and by phosphatase, coupled with a study of the specificity of the enzyme preparations involved. Quantitative results were obtained by application of enzymatic digestion to systems of isolated nuclei so that chemical analysis could be made.

The crystalline DNase preparation of Kunitz has been shown by this investigation to contain at least two distinct DNase activities. A disaggregase and a depolymerase may be identified. The activities differ with regard to pH optima, order of reaction, limiting concentrations in the crystalline preparation, and by varying ratios of activity in different tissue extracts.

The activity of the depolymerase is correlated with an increase in the secondary dissociations of the phosphoric acid residues; with the attainment of a smaller size molecule; and with a loss of the ability to form an insoluble precipitate with protamine. Measurement of the diffusion coefficient of the end-product of the reaction showed that the molecular weight is about 1200, assuming a density of  $1.34 \text{ gm/cm}^3$ .

The disaggregase activity is found in the DNase preparation in much greater amount. It is most conveniently measured by determining the rate of loss of structural viscosity of DNA. The loss of viscosity is not correlated with an increase in secondary phosphoric acid dissociations or with the loss of ability to precipitate with protamine. The loss of structural viscosity can theoretically be correlated only with the loss of asymmetry.

Complete depolymerization probably involves two steps: (1) The first step consists in breaking a bond presumably holding together aggregates of DNA in large asymmetrical micelles.

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\* Microfilm copy of complete manuscript of 152 pages, \$1.90. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-72.

(2) The disaggregated units can then be broken down to low molecular weight products by depolymerase acting on covalent phosphoester bonds between nucleotides.

Observations of *Chironomus* salivary gland chromosomes by ultraviolet photomicroscopy showed that the removal of DNA by DNase could be attributed to the true depolymerizing action of the preparation. That is, the hydrolysis of inter-nucleotide bonds removed the nucleic acid.

Quantitative experiments of the same nature on isolated beef thymus gland nuclei led to the following conclusions: (1) Depolymerase is necessary for the removal. (2) No protein accompanies the removal of the DNA. (3) Only a constant fraction of the nucleic acid may be removed, 77% in the case of beef thymus.

The previously reported effects of phosphatase on chromosomes can be attributed to contamination of the phosphatase preparation with trypsin. Treatment of the enzyme solution with crystalline soy-bean trypsin inhibitor destroys all effects of the enzyme on nuclei. This observation clears up the formerly existing paradox as to how phosphatase could attack DNA in the nucleus and not in vitro.

The results of the experiments are best explained by considering the DNA to be attached to the protein moiety only at selected points along a high-polymer DNA chain. Depolymerization causes the removal of pieces of DNA from between the attachment points. The residual DNA represents those fragments of the DNA bonded at the attachment points to the protein.

The close correlation between the amount of residual DNA and the arginine content of the nucleus was considered with reference to the nature of the bond holding the residual DNA. The tentative postulation of a covalent bond between the DNA and the arginine of the protein has been made.



GERM CELL CYCLE OF ECHINOSTOMA REVOLUTUM  
(FROELICH, 1802) (ECHINOSTOMATIDAE: TREMATODA)

(Publication No. 2387)\*

Helen Mar Churchill, Ph.D.  
University of Michigan, 1951

Reproductive processes were studied in each generation: miracidium-sporocyst, first and second generation rediae, and cercaria-adult, and additional information obtained concerning the life history.

Miracidia metamorphose into sporocysts, not into rediae, as reported by Johnson (1920). Although the cercariae penetrate, and encyst in, a variety of hosts, miracidia are quite host-specific. The life cycle was completed experimentally only in Helisoma trivolvis, the natural host of this particular strain.

Oögenesis and spermatogenesis were studied in the adult. There are two maturation divisions. Union of the haploid gametes restores the diploid number of chromosomes, which is maintained throughout development of the various generations. The diploid number of chromosomes is twenty-two.

The historical survey includes a tabulation of the chromosome numbers reported for Trematoda by various workers.

In each generation, the first cleavage division is unequal, and the second cleavage involves only the larger cell. Since these divisions resemble cleavages in digenetic trematodes in which germinal lineage has been traced, the smaller of the first two cells has been designated the propagatory cell. Germinal lineage has not been demonstrated in E. revolutum, since the propagatory cell could not be identified in subsequent divisions.

Germ cells in miracidia-sporocysts and rediae were first recognized as formation of the body cavity occurred. Multiplication of germ cells free in the lumen was not seen. In older rediae of both generations, germ cells develop in the redial wall and then pass into the lumen. Germ cells in the sporocyst and redial generations develop without maturation or fertilization.

A germ mass, which contains germ cells and young embryos, develops in each first and second generation redia. Germ cells develop directly into embryos without dissociation of the germ mass. There seems to be no multiplication of germ cells in the germ mass.

\* Microfilm copy of complete manuscript of 88 pages, \$1.10. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A51-131.



In the cercaria, the earliest recognized stage in the development of the reproductive system is a rounded mass of small, darkly-staining nuclei when the embryo is in the late "germ ball" stage. These nuclei multiply and give rise to the fundamentals of the testes, ovary, Mehlis's gland, cirrus and genital ducts. No further development of the reproductive system occurs until the parasite is in the definitive host.

Although germinal lineage could not be traced in E. revolutum, the first cleavage divisions of each generation resemble each other, and are similar to corresponding cleavages in digenetic trematodes in which germinal lineage has been traced. The finding that germ cells develop in the radial wall does not preclude the possibility of germinal continuity. The concept of germinal lineage with polyembryony has been applied to the life cycle of digenetic trematodes by other workers. The similarity between reproductive processes in E. revolutum and in these other species makes it appear probable that reproduction in E. revolutum can also be interpreted as germinal lineage with polyembryony, but germinal lineage could not be demonstrated.

THE EFFECTS OF THE HOMOZYGOUS MINUTE-IV  
DEFICIENCY ON THE DEVELOPMENT OF  
DROSOPHILA MELANOGASTER

(Publication No. 2328)\*

Marjorie Whyte Farnsworth, Ph.D.  
University of Missouri, 1951

The abnormal development of the homozygous Minute-4 embryos of Drosophila melanogaster was studied and comparisons with the normal animal were made. Proof that the defective organisms investigated were actually Minute-4 homozygotes was presented.

The abnormal embryos die in the egg stage, and the developmental events leading to their death are described. Homozygous Minute-4 individuals cannot be distinguished from the controls until after ten hours of development. The major embryological anomalies are found in the midgut region, the foregut, and the central nervous system.

Although formation of the midgut proceeds normally, lengthening and coiling of this structure is greatly retarded. Fragility of

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\* Microfilm copy of complete manuscript of 142 pages, \$1.78. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-74.

the walls of the midgut results in the release of yolk to the hemo-coel. The midgut and the body spaces are crowded with this material even in late stages, while in normal individuals, such stored food is rapidly utilized. From these observations, it is concluded that the yolk metabolism of the homozygous Minute-4 embryos is impaired.

Abnormalities of the foregut consist of incomplete head involution with consequent aberrant formation of the cephalopharyngeal apparatus. The frontal sac usually fails to develop.

The central nervous system, although initially normal, is later characterized by the loss of a variable number of ventral ganglia. Usually the fifth through the seventh pairs are missing. In addition, certain of the interganglionic connectives fail to develop and, therefore, two or three pairs of ganglia remain posteriorly when condensation of the nervous system occurs. Nerve fiber regions persist as distinct structures and do not become unified into a single, central mass as in normal organisms.

Other abnormalities occur somewhat later in ontogeny. The somatic musculature undergoes incomplete differentiation and the body segmentation becomes indistinct. In addition, the esophagus, heart, and fat bodies fail to develop.

The observations are interpreted in terms of the hypothesis that all anomalies of the homozygous Minute-4 embryos can be traced to a generalized retardation in development occurring just before the time when such defects become visible. It is suggested that the physiological derangement which brings about this delay in development can be attributed to insufficient amounts or lack of one or more essential enzymes.

#### PARASITOLOGICAL STUDIES ON ONCHOCERCIASIS IN GUATEMALA

(Publication No. 2402)\*

Colvin Lee Gibson, Ph.D.  
University of Michigan, 1951

The present investigation had as its primary objective the careful study of the fate of microfilariae of Onchocerca volvulus when ingested by various species of Simulium, with particular reference to the development of the organ systems of the Onchocerca larva. Repeated failure of laboratory-reared flies to bite made it

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\* Microfilm copy of complete manuscript of 106 pages, \$1.33. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-146.

necessary to use wild flies for the experimental infections, and to develop suitable methods for maintaining them alive in the laboratory. A control series of flies was collected concurrently with the experimental flies in order to evaluate the experimental results in relation to the natural rate of infection in wild flies. In order to ascertain if other onchocercal infections existed in the region, the local animal fauna was examined for filarids. Studies were also done to determine if treatment of human onchocerciasis with Het-razan (Lederle) adversely affected the microfilariae which reappear after the treatment.

A total of 1,167 laboratory-reared blackflies (Simulium metallicum, S. ochraceum, S. callidum, and S. downsi) were given an opportunity to feed on human volunteers. Only 14 flies actually fed, and 11 of these belonged to S. downsi, the least anthropophilic of the four species.

About 6,000 pupae of the anthropophilic species of Simulium were allowed to emerge within a large outdoor cage. A human volunteer spent at least two hours daily within the cage during a five-week period, but none of the flies attempted to feed.

Techniques are described whereby wild simuliid flies which have fed on a subject in the field can be maintained in the laboratory for periods up to 13 days. Approximately one-half of the flies survive only two days, and about five per cent survive one week.

About 12 per cent of the horses and 12 per cent of the cattle in the onchocerciasis region of Guatemala carry skin-inhabiting microfilariae of the species Onchocerca reticulata and O. gutturosa, respectively. These species can be distinguished from each other and from O. volvulus, the human parasite, by the form and arrangement of the caudal nuclei.

One of three horses autopsied was infected with adult Onchocerca reticulata, and 87.2 percent of 148 cattle were infected with adult O. gutturosa.

Simulium ochraceum will support the development of Onchocerca volvulus at least as far as the "sausage" stage, which is well developed by the fourth day. Developing larvae have been recovered from Simulium metallicum and S. callidum seven days after infection.

Simulium callidum shows a greater mortality when infected with Onchocerca volvulus than do S. metallicum and S. ochraceum, suggesting that the former is not as efficient a vector as are the latter two species.

Details of the morphological development of Onchocerca volvulus in Simulium spp. through the seventh day are given. Microfilariae leave the gut of the fly within 24 hours and migrate to the thoracic muscles, where further development takes place. By the third day the larvae grow shorter and somewhat broader, and the

differentiation of the nuclear column begins. Tremendous growth in both length and breadth begins on the fourth day and continues through the seventh day. The esophagus and intestine become differentiated on the fourth day, and the intestinal lumen appears on the fifth day. The rectal plug and subcuticular cells are distinct by the fourth day. The genital anlage appear on the sixth day. No further differentiation can be seen on the seventh day, but the larvae continue to grow in size. Study of the later developmental stages was prevented by the difficulty of maintaining infected flies alive under laboratory conditions.

Hetrazan (Lederle) produces a temporary destruction of the microfilariae of Onchocerca volvulus in the skin, but viable larvae reappear within a few months, and they are capable of infecting simuliid flies. Hetrazan therefore is of no value from the standpoint of preventing transmission of onchocerciasis.

#### MUCOPROTEINS IN DIGENETIC TREMATODES

(Publication No. 2418)\*

Francis Jeremiah Kruidenier, Ph.D.  
University of Michigan, 1951

This is a study of the distribution and function in digenetic trematodes of the polysaccharide-protein complexes commonly termed mucoids or mucoproteins. The origin, development and distribution of these compounds are determined by the use of mucicarmine, muchaematin, neutral red, methyl green and metachromatic dyes. More specific chemical reactions and digestion by mucolytic enzymes (hyaluronidase ?) are also employed.

Paired, homologous mucoid glands develop ventrally from the region of the oral sucker to the tail stem in cercariae of the virgulate, armate, ornate, opisthorchoid and certain microcercous groups. Structures in the emerged cercariae of all of these groups of cercariae are employed for the storage of mucoids from these glands; but the glands are not retained by any of the fully matured cercariae. The virgula organ, the caudal pocket, and the ventral groove in the body of Paragonimus kellicotti are all employed in this manner.

Analogous mucoid-producing glands are formed in monostome and fasciolid cercariae. Similar stain reactions, morphology and distribution suggest that the glands of these species are homologous.

\* Microfilm copy of complete manuscript of 386 pages, \$4.83. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-162.



Demonstrable mucoids are not present after the emergence of these cercariae and hence must be used prior to their emergence from snail hosts.

Stainable mucoids have not yet been found in the *Agilis*, *Megalura*, *Gorgonocephala*, *Echinochasmodon* and *Cotylocercous* cercariae.

Observations of emerged living and mounted specimens indicate that mucoids supplement oral suckers and acetabula as a means of attachment to substrates. Evidence indicates the further use of mucoids during cercarial maturation and emergence, during their free existence, and during or after their penetration into second intermediate hosts. Mucoids may further be employed as an aid to either cuticula or cyst formation in the fasciolids.

The significant role played by mucoproteins in adult *Digenea* is indicated by their wide occurrence in adult *Paragonimus kelli-cotti*. In this species cuticular reactions to mucoid-differentiating dyes vary from a strong basal metachromasy to lightly reactive intermediate regions and an indifferent outer layer, indicating that mucoids are involved in cuticula formation. Strongly metachromatic subcuticular glands are the only apparent source of these mucoproteins.

Oral, pharyngeal and esophageal glands and others associated with the terminal excretory duct, Laurer's canal, the genital atrium and terminal vas deferens and metraterm are also variably metachromatic. Strongly metachromatic glands are associated with the suckers and others are enclosed within those organs.

Intestinal epithelia contain mucoids. Mucoid substances formed within vitelline cells aggregate around the nuclei of those cells during their late development and passage through vitelline ducts, persisting in the cells after their incorporation into the formed eggs.

Mucoids are present in the cytoplasm of the oöcytes, appearing to function in the amoeboid movement of these cells and during their fertilization. Mucoids are more concentrated in spermatocytes and spermatozoa. They form a reticulum in the cells of Mehlis' gland, appearing to be involved in egg shell formation, and are also present in neurones and parenchyma cells.

The ability to form the polysaccharide-protein linkage appears to be a fundamental property common to most tissues of the *Digenea*.

THE LIMNOLOGICAL RELATIONS OF INSECTS TO  
CERTAIN AQUATIC FLOWERING PLANTS

(Publication No. 2427)\*

Young John McGaha, Ph.D.  
University of Michigan, 1951

Limnological relations of insects to 13 species and 1 variety of hydrophytes were investigated in 5 counties of the Lower Peninsula of Michigan. Sixty-one species of insects were studied of which 58 are either phytophagous or at least under certain conditions use tissues of hydrophytes as food. Two predators and 1 parasite were also included. The species number as follows: Homoptera, 3; Coleoptera, 16; Trichoptera, 20; Lepidoptera, 7; Diptera, 14; Hymenoptera, 1. In addition, certain unidentified Odonata, both Zygoptera and Anisoptera, insert eggs into the plant tissues studied. The total number of kinds of insects found associated with each plant is as follows: Sagittaria latifolia, 9; Sagittaria latifolia diversifolia, 10; Anacharis canadensis, 2; Vallisneria americana, 4; Zizania aquatica, 4; Ceratophyllum demersum, 0; Nymphaea odorata, 25; Nymphaea tuberosa, 15; Nuphar advena, 13; Nuphar variegatum, 24; Brasenia Schreberi, 2; Myriophyllum exalbescent, 7; Myriophyllum heterophyllum, 7; Utricularia vulgaris, 1. These plants do not belong to closely related taxonomic groups. They may be placed into 3 ecological assemblages on the basis of their growth forms and relations to water. Although there is some intergradation, each of these aggregations supports a characteristic insect assemblage. The insects studied in this investigation show various degrees of restriction in their choice of food plants. Those living on submerged hydrophytes make use of a wide variety of plants, others which feed on floating or emergent vegetation may be restricted to one or a few species of plants. These insects vary in their degree of aquatic adaptation from those equipped with gills and well suited to life in water to those with holopneustic respiration. The phytophagous Trichoptera when kept under crowded conditions in aquaria often became predaceous or even cannibalistic. In the laboratory species usually considered as predatory consumed quantities of plant tissues. Some phytophagous Trichoptera larvae feed during both day and night inflicting characteristic damage upon different plants. Factors such as wave action, silting and certain kinds of pollution either

\* Microfilm copy of complete manuscript of 167 pages, \$2.09. Enlargements 6" x 8", 10¢ per page. Library of Congress Card Number Mic A 51-171.

prevent insects from living on plants or greatly reduce their populations. Fluctuations occur in numbers of insects on hydrophytes. They can usually be explained upon the basis of emergences and broods. Several species of insects are recorded from certain counties for the first time and a few are new records for Michigan. The hydrophytes investigated suffer considerable injury due to these insect infestations. Eggs and respiratory spines are inserted into plant tissues; juices sucked down from leaves; parts of leaves used for case-making; stems, roots and petioles gnawed upon or burrowed into and plants sometimes completely defoliated. These hydrophytes support a large, heterogeneous insect fauna of which some species are intimately, and in some instances obligatorily, related to the plants. Others subsist on a wide variety of both animal and vegetable matter and no species of plant studied is essential for their well-being so long as an adequate food supply is available.

**DISSERTATION ABSTRACTS**

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